



# FLIGHT

The  
AIRCRAFT  
ENGINEER  
&  
AIRSHIPS



First Aero Weekly in the World

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EDITORIAL COMMENT



ALLEGATIONS which can only be described as terrible are made in the report issued last Saturday by the Select Committee on National Expenditure. The portion relating to aeronautics is reproduced elsewhere in these pages. A sub-committee was appointed to enquire into certain aspects of Air Ministry finance, and the principal witness called was Sir John Hunter, Administrator of Works and Buildings. According to his evidence, no man employed on the construction of aerodromes—and there were 70,000 of them—earned the money he got. Further, fraud seems to have been rampant, and has so far not been visited with punishment. Sir John avers that in the case of the Renfrew aerodrome he "found a conspiracy of Government men and contractor's men, and suspected that the contractor himself was also in it." Four men were arrested, and have been out

on bail for four months, but the Crown authorities refused to prosecute, and the men have now been freed from the charge. As to the reason why the Crown declined to prosecute, a letter from the Secretary to the Lord Advocate to the Secretary of the Air Ministry was put in in explanation. This letter states that: "The evidence available is insufficient to afford any strong probability of obtaining a conviction. There is no evidence at all that any of the accused applied to their own uses any of the money said to have been improperly obtained from the Ministry. The circumstance, though it does not in itself provide an answer to a charge of fraud, makes the insufficiency of the evidence more formidable than would otherwise be the case. Further, a prosecution would reveal what appears to be inefficiency and absence of control on the part of the representatives of the Ministry on the spot."

Sir John Hunter, in reply to this simply extraordinary letter, pointed out that it was admitted that the books or time sheets were falsified by entering thereon the names of men said to be employed on the job, but who did not in fact exist. Wages were drawn regularly and charged to Government as having been paid to these men. "Would not," asked Sir John, "any jury draw the obvious inference that the persons responsible for putting these 'dead men' on the books and drawing wages regularly for them from Government funds had, in fact, put the money in their own pocket? And is there not evidence that this was done with the connivance of the clerk of works?" Later, Sir John saw the Lord Advocate personally, but the latter refused to alter his decision not to prosecute.

It is very clear that such matters as these cannot be allowed to rest where they are now. As a matter of fact, Sir John has caused a civil action to be entered against the contractor for about £50,000, but although it is possible that this action may succeed, that would only mean the recovery of a certain amount of public money. Whatever the result of this civil action may be, it is a thing entirely apart from the charges of fraudulent practices alleged against a number of people concerned in the construction of this aerodrome. No one who reads the evidence with

What is Behind It?

an unbiassed eye can fail to come to the conclusion that prosecutions ought to have been initiated at once. The most extraordinary aspect of the whole thing is the refusal of the Lord Advocate to go on with the criminal proceedings. We are not learned in the niceties of the law, but if ever we have seen what seems to be a good *prima facie* case for a criminal prosecution it is supplied by one where, admittedly, names of men who had no existence in fact were entered on a pay roll and their wages regularly drawn. If the money was drawn, it must have been drawn by someone. Clearly, it was not passed on to men who did not exist, so it stopped somewhere, and where that somewhere is should be easy to find out. We find it more than difficult to believe that the refusal to prosecute is not contained in the final paragraph of the letter from the Lord Advocate's Department: "A prosecution would reveal what appears to be inefficiency and absence of control on the part of the representatives of the Ministry on the spot."

We imagine that every unbiassed person who reads the letter will agree with the conclusion that we ourselves have arrived at. The clear inference is that there is someone whom it is desired to shield from the consequences of inefficiency or slackness, or worse. But that will not do. No matter who the persons, or how highly connected they may be, or whatever the influence they have been able to bring to bear to stifle enquiry, the names must be given to the public and the proper action taken to make them pay for their *laches*, whether the remedy against them be civil, military or criminal. As to the actual participants in the "frauds," it is not too late for the authorities to move, and move they must. There has been too much hushing up of war scandals, and the people are just about tired of apologies for the guilty. They want heads.



**More of It** It is not only in the matter of aerodromes that extravagance, inefficiency and graft seem to have been the order of the day. In investigating the clothing contracts, Miss O'Sullivan, Clothing Controller of the W.R.A.F., was called upon to give evidence, and said that the work of inspection was done by forty men, but that it could have been quite efficiently carried out by twelve women! That sort of thing seems to have been quite usual in the W.R.A.F. We ourselves have more than once directed attention to similar abuses of hopeless over-staffing of W.R.A.F. units. Cases have come to our notice of stations where a dozen men were kept, doing absolutely nothing, because the women either could not, or were not allowed to, carry out in their entirety the duties for which they were enlisted. Therefore, the story of forty men doing the work of a dozen women leaves us comparatively cold, except that it furnishes yet another example of the appalling waste of public money and of effort which seems to have been part of the War system. The more we hear about the manner the War was conducted, the more we marvel at our successful issue from it.

We are on more serious ground when we come to regard the allegations in connection with the placing of clothing contracts and with the removal of Miss O'Sullivan from the post of Controller of Clothing. Miss Douglas-Pennant, who gave evidence, said that this lady was removed behind her back and without

her foreknowledge. As it was stated that Gen. Seely has ordered an enquiry into Miss O'Sullivan's allegations of irregularities in the placing of contracts, it will be better to treat this part of the affair as being *sub judice* and therefore not a proper one for comment at this stage. This may, however, be said at this juncture, that the broad allegations having become public property any enquiry into details should likewise be public. There must be no hole-and-corner procedure about it. Not only is it due to the public that they should know who is guilty, if anyone be guilty, of misfeasance or incompetence, but it is equally due to officers and officials whose names have been publicly mentioned that they should be as publicly cleared of odium if enquiry established that they have not been to blame.

It is almost unimaginable that the existence of these scandals, and others which have not been touched upon by the Committee's Report, were entirely unknown to those in authority. The latter do not appear to have made the slightest attempt to check the wicked waste of public money. Nor, if the Renfrew case is a fair sample of the attitude of mind of those responsible, does any effort seem to have been made to bring to justice people who are alleged to have been guilty of offences which are next door to plain theft. Therefore, it is hardly too much to say that they have placed themselves in the position of being "accessories after the fact," inasmuch as they have more or less condoned malpractices in order that light should not be shed upon departmental incompetence and slackness. Just what action can be taken regarding them it is difficult to say at the moment. Fortunately, the disclosures have raised such a storm of indignation throughout the country that something must, and, we doubt not, will be done, but whether the punishment will be made to fit the crime remains to be seen. To judge by the precedents, we fear it will not.

The one bright spot in the Committee's report is the tribute paid to Gen. Sir Hugh Trenchard and his work. We are unfeignedly glad that the Committee has thus put its opinions on record. No one who knows Gen. Trenchard—or Air Vice-Marshal Trenchard, to be up-to-date and correct—could for a moment imagine that he could have known what was going on without an effort to stop it, and in the endeavour to find out who was the high authority mostly to blame, it is fair and fitting that it should be stated as explicitly as possible who was *not* in fault.



#### Where Will be the Reduction?

One of the aims with which we entered the late War was the total destruction of the spirit of militarism and all it stands for, and as a resultant the reduction of the burden of armaments which had for years pressed heavily upon all the European peoples, including not least ourselves. While we are all for an efficient and sufficient scheme of national defence, we cannot help asking when and how the promised reduction in the cost of preparation for war is going to be effected? We are fully aware that no sensible reduction in armaments is possible while the world is in its present disturbed state, but what causes us grave concern is that no one seems willing to take the initiative in proposing a future policy. The Navy is still adding ships to the list, and the pay of increased numbers of officers and men

## Flight—And the Men



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MR. C. R. FAIREY, Chairman and Managing Director of the Fairey Aviation Company.



on the permanent establishment is likely to be, after all allowances have been made, far in excess of pre-War figures. The standing army, instead of being reduced, is, apparently, to have a peace establishment well above that existing at the outbreak of war, and, as in the case of the Navy, increased pay threatens to double its cost as compared with the period ending in August, 1914. Additional to these services, we now have the Royal Air Force, the great deciding factor of the future. If we are to permanently carry all these extra estimates, it looks as though we had fought to rivet the chains of militarism more tightly about our necks. Instead of the burden of armaments being lightened, it appears as though it were to be more than doubled.

We have always been the first to argue that we must have an adequate air force. Indeed, we have gone much farther and laid it down that it is essential to our existence as an Empire that we must be supreme in the air as at sea. But supremacy is a relative matter, and we must see that we do not overstep the bounds of what is actually requisite to safety.

Also, if we are to be compelled to maintain such an air force as will be able to maintain an unchallenged superiority over possible enemies, reductions must be made in the other services to compensate. It seems to us that the whole question of the relative size of each of the fighting Services is a matter that can only be settled by a central authority, able to view the necessities as a whole. Naturally, the sailor, the soldier and the airman each takes his own view of the needs of his particular Service, and so estimates are swollen at the dictation of the experts. Here, we think, is a strong argument for grouping the Services under a single Ministry of Defence which is able to visualise the general problem of defence as one and not three. We agree that there are counter-arguments, but in the present state of the country's finances it is urgently necessary to seek out every road to economy and to pursue it, provided always that it does not jeopardise our safety as a nation and an Empire.

### The Profitteering Bill

Profiteering is a theme which interests everyone, since in some shape or form it touches us all. Indeed, this is far too mild a statement of the case, since it is safe to say that there is not a single article of commerce or a single commodity which has not been profiteered to the utmost possible limit of what the public will stand. The action of the Government, therefore, in bringing in a Bill designed to stop the wicked exploitation of the public is timely enough, though it may be doubted if it will be effective. Profiteering by the retailer is easy enough to stop. To do that it is only necessary to lay down a scale of prices for commodities and to prosecute where these prices are exceeded. But although the retailer has shown himself to be as bad a profiteer as any, profiteering does not begin or end with him, and to punish him while the bigger fry are allowed to slip through the noose is neither justice nor utility. If profiteering is to be killed, it must be sought out and killed at its source. There has been to the full as much profiteering in raw materials as there has been in the finished article, and it is perfectly obvious that unless profiteering can be checked at every stage of production it is quite useless to lay down maximum prices of sale to the public after the worst of the

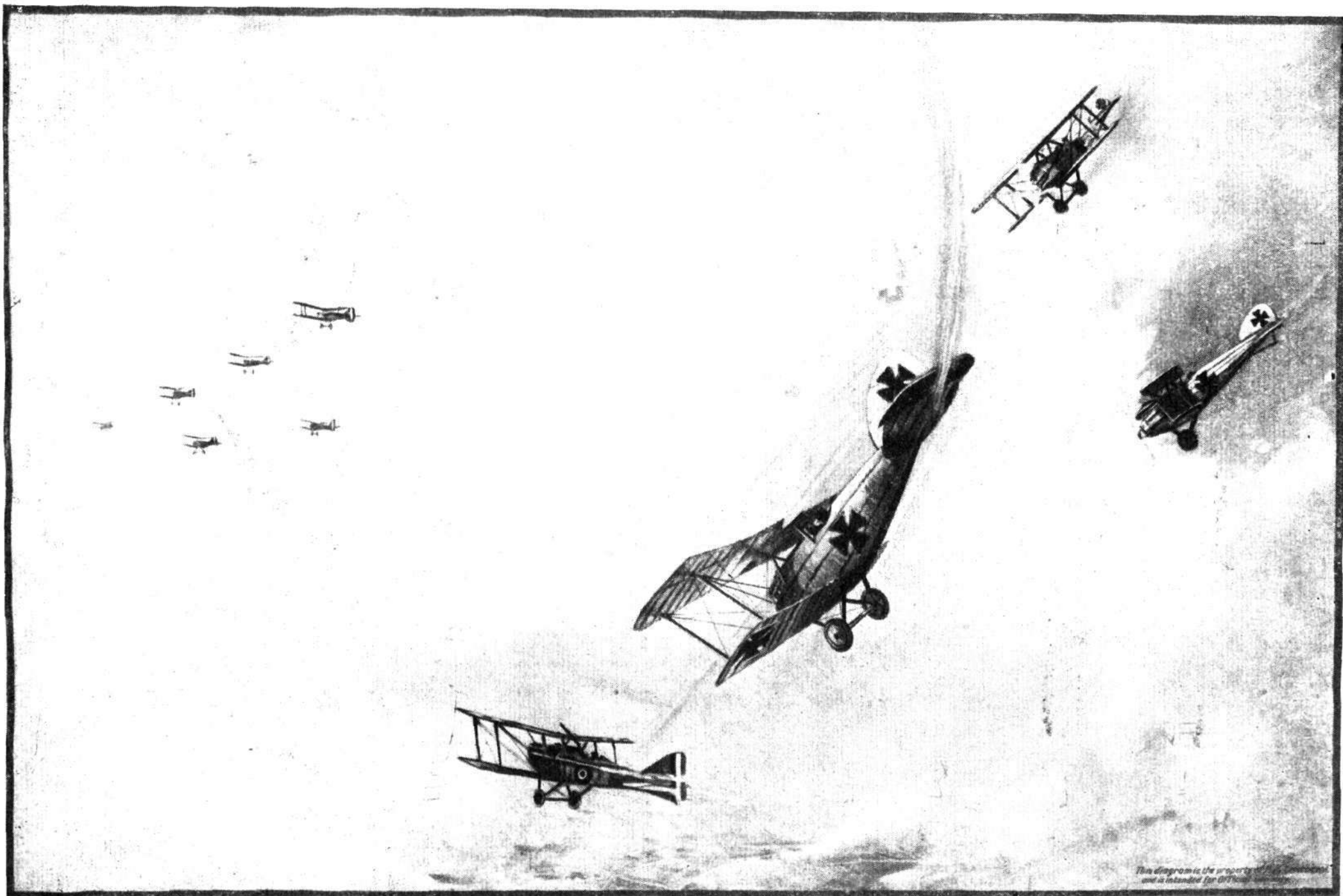
profiteering has been done. It is not the *actual* costs, after a dozen or so profiteers have taken toll at as many stage of production, which matter. It is the costs as they should be, after showing a reasonable margin of profit at the various stages, which require to be dealt with. That would be a colossal work, and one which we fear would be outside the bounds of practice. Even if it were not, we doubt if this Government dare go the whole way and go for the trusts and combines which are mainly responsible for keeping production down and prices up. If they did, the probability is that they would find some unexpected and decidedly embarrassing fish in the net. That they know, and therefore the net they are casting is one designed to catch the small fish only.

If the Government is sincere in its desire to stamp out profiteering, let it bring in a Bill declaring trusts and combinations illegal, as they are in America, and thus inaugurate a new era of unrestricted competition between individual manufacturers and distributors. Then production would increase and prices would fall again. Unfortunately, there are too many of the trust magnates in high places, and this is one of the things the Government dare not do. If they dared, they would surely have acted on the presentation of the Report of the McCurdy Committee on Trusts, which is as illuminating a document as we have seen for a considerable time. This much is certain, that if Parliament does not act before very long and check the tendency to the formation of trusts and combines, the people will take matters into their own hands and force the issue.

### A Big Private Purchase of Machines

What is probably the biggest single-handed purchase of aircraft has just been made by an Australian, Mr. S. W. Copley. Beyond the fact that Mr. Copley is well known in insurance and financial circles, no one seems to know what interest he has in aviation or the purpose for which he has just become the biggest private owner of aeroplanes. However that may be, he has bought from the Government 300 aeroplanes, and intends to embark on a commercial flying enterprise, about which all he will say is that it primarily concerns this country. Interviewed by an evening newspaper, he said that some of the machines would be resold, while others would be devoted to the encouragement of commercial aviation. As Mr. Copley apparently desires to keep his intentions to himself for the time being, we shall not presume to attempt to speculate on them. We should probably not succeed in penetrating his plans in any case, so it is just as well. It seems to be quite obvious, however, that he has a plan, for without some concrete idea of what use such a number of machines are to be put to, no one but a lunatic millionaire would or could purchase them—and Mr. Copley is certainly not a lunatic, though he may, for all we know, be a millionaire. As a matter of fact, he seems to have some very definite and sound ideas on commercial flying. It is bound to come, he says, and bound to pay in the long-run, and he means to be in it. Well, we most sincerely wish him all success in his enterprise. The movement badly needs men with money, initiative and faith to get it going and help it through the two or three lean years it must encounter before aviation takes its place as an established factor in transport service.





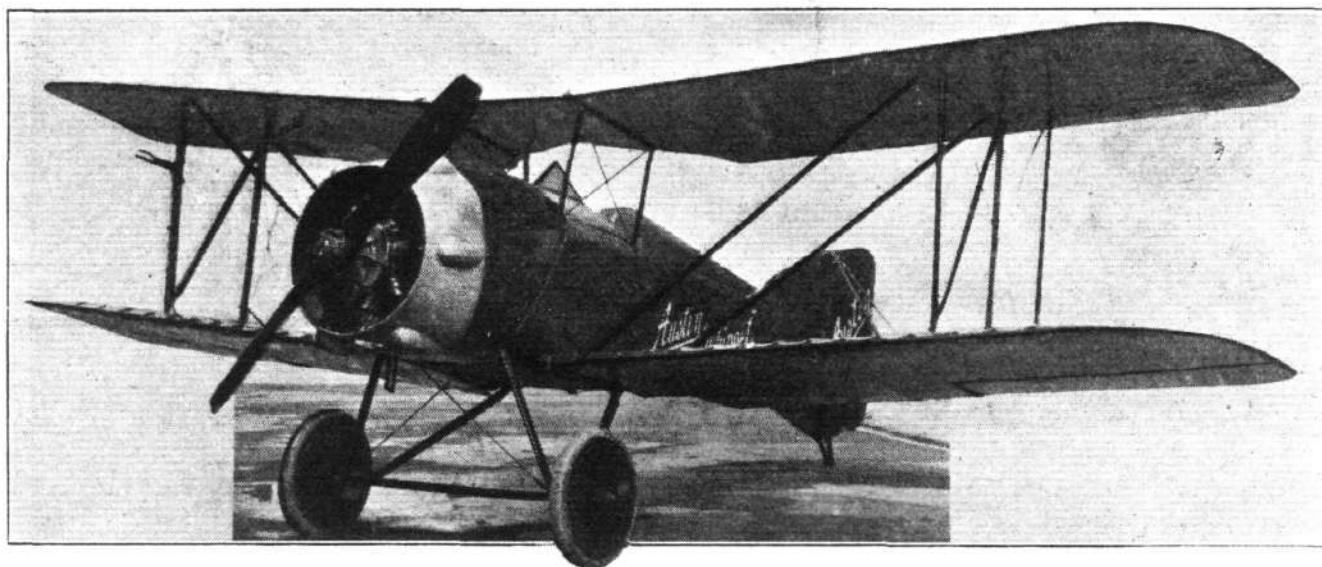
" THE JACKALS."—The importance of keeping formation cannot be too strongly impressed upon the pilot. Loss of position is likely to lead to an adventure with the Jackals. (Drawing prepared by the Air Technical Services for use at the R.A.F. Schools.)

## THE AUSTIN "WHIPPET"

Up to now it has been necessary for the "Amateur" pilot to have a certain amount of mechanical knowledge, in addition to knowing how to fly, in order to keep his machine in flying trim and safe—unless, of course, he has the services of a skilled mechanic or mechanics. In other words, the non-mechanical owner-pilot has only now been catered for in

small building or tent, one 8 ft. wide, 18 ft. long, and 8 ft. high being sufficient for the purpose.

As shown in the accompanying scale drawings, it is fitted with a two-cylindere horizontally-opposed engine, but we understand that a six-cylindere 45 h.p. Anzani engine will be fitted in all future models.



Three-quarter front view of the Austin "Whippet."

the Austin "Whippet," which has just been produced by the Austin Motor Co., Ltd., of Birmingham, to the designs of Mr. J. Kenworthy—the firm's chief aeronautical engineer, associated in the early days with Mr. G. de Havilland at the Royal Aircraft Factory.

The salient points of the Austin "Whippet" are:—It is a small single-seater tractor biplane with an all-steel fuselage, folding wings, no bracing wires, and it is a safe and easy machine to fly. Furthermore, it is proposed to place this

The principal dimensions of the "Whippet" are: Span, 21 ft. 6 ins.; length, 16 ft.; chord, 3 ft. 8 ins.; area of main plane, 134 sq. ft. The weight of the machine empty is 500 lbs., and fully loaded 730 lbs. It has a speed range of 30 to 95 m.p.h., and climbs to 5,000 ft. in 6 mins., and 10,000 ft. in 14 mins. Fuel is carried for a flight of two hours' duration.

As previously stated, the fuselage is of steel construction throughout, and is built up in two sections, being divided at a point immediately behind the cockpit. The longi-

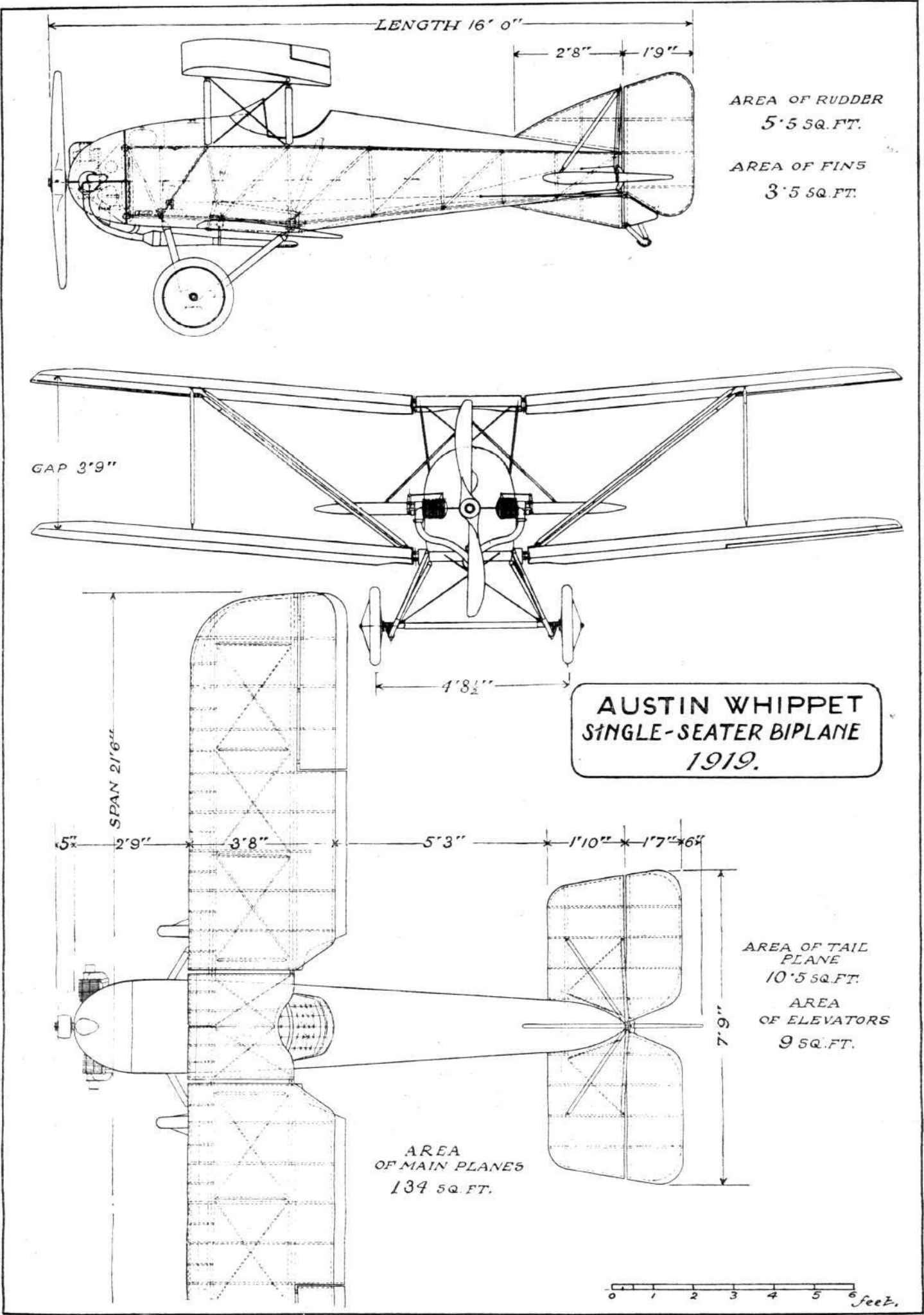


Three-quarter rear view of the Austin "Whippet."

machine on the market at the comparatively low price of £400 to £500.

In view of the fact that bracing wires have been practically eliminated, and that the wings are made to fold back, the "Whippet" is a machine that should appeal particularly to the "owner-pilot," for frequent adjustments and rigging—especially when folding the wings in position for flight—are thus avoided, whilst the machine can be housed in quite a

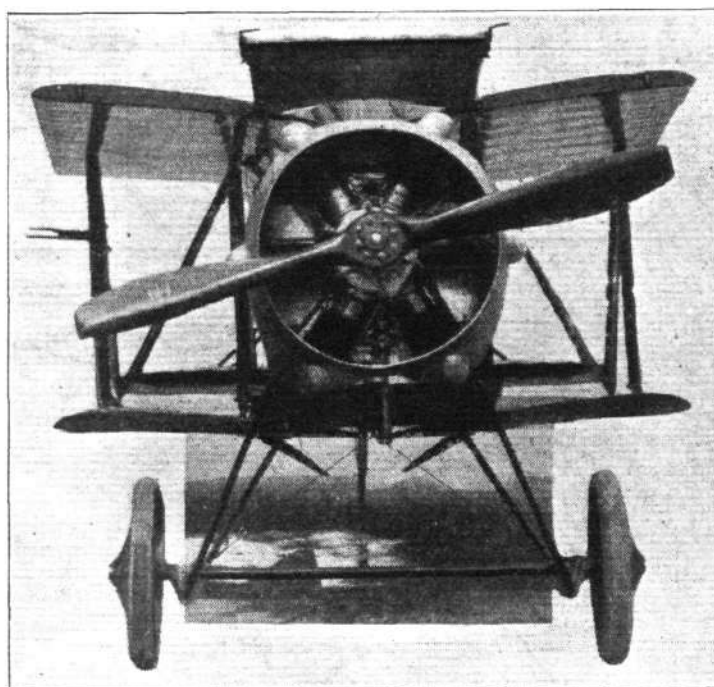
tudinals, diagonals and cross-members are of circular-section steel tubing, and are readily replaceable. Bracing wires are entirely eliminated, and it is claimed that the whole frame-work is not affected by climatic conditions. The engine is overhung from the front of the frame, and a special shock-absorbing device, consisting of rubber buffers, is fitted between the fuselage and the engine-bearer. The engine is enclosed in an aluminium cowl.



THE AUSTIN "WHIPPET" SINGLE-SEATER BIPLANE: Plan, side and front elevations to scale.



The main planes have been designed with a high factor of safety, and are of standard wood construction with hollow box-section spars. Steel tubes are employed for the compression members, and internal bracing is by steel piano-wire. One set of "N" struts, of streamlined steel tubes, separate the top and bottom planes on each side of the fuselage, and the top centre section is supported above the fuselage by two pairs of vertical streamlined steel struts. This portion of the cellule alone is wire-braced. The upper and lower wings are hinged at the roots of the rear spars to the top centre section and fuselage respectively. Bracing for lift and incidence is by streamlined steel tubes, which are anchored at their lower ends to the roots of the lower wings, and are thus not disconnected when folding the wings. In order to correct incidence, the rear lift struts are made adjustable. Both upper and lower wings are given a dihedral of about 5°, but are otherwise "straight." The top plane is staggered forward some 3 ins. When folded back the wings are supported and locked by tubes attached to the



Front view of the Austin "Whippet" with the wings folded.

portion can easily be changed. The tail plane is of comparatively thick streamline section, and is braced by telescopic streamlined steel tubes. Its angle of incidence can also be adjusted to correct the c.g. for different weights of pilots. The elevators and rudder are of standard design, the framework being of steel tubing and the ribs of wood. A triangular vertical fin is mounted both above and below the fuselage.

The landing chassis is of the ordinary V-type, the V-struts terminating at their lower ends in pressed steel sockets, tubular tie-rods connecting each V. The axle rests in between the V where it is attached by the usual elastic cord. Bracing is by streamline steel wire. The tail skid is of the swivelling type, the skid itself being made of two steel pressings welded together. In order to provide a good wearing surface, a special shoe is fitted, consisting of ten vertical laminated plates. The springing of the skid is obtained by making the supporting strut of telescoping tubes operating on a compression spring.



Side view of the Austin "Whippet," with the wings folded.

fuselage, and when in flying position are locked by a quick-release but positive locking device. Ailerons are fitted to the top planes only.

The tail plane is of similar construction to the main planes, and consists of two outer portions and a centre portion, which simplifies the question of spares, as either outer

The elevators and ailerons are operated in the usual way by a "joy-stick," and the rudder and tail skid by rudder-bar. Operating rods are used for the engine control. For starting the engine a small induction pump is fitted, which forces a firing mixture into the cylinders, and a starting magneto inside the fuselage ignites this charge.

### Parliament and Wireless Telephony

MANY Members of Parliament availed themselves of the opportunity of hearing something of the development of wireless telephony at the demonstration on Monday arranged by Major-General Seely. The R.A.F., he said, took up the subject early in 1915, and by March, 1918, the first two squadrons of aeroplanes had been fitted with the apparatus, which gave them such an advantage that it was found that German machines took care to avoid them. The postal aeroplanes, such as those plying between Kenley and France, are now so fitted. Ranges of 100 miles from an aeroplane and of 165 miles from an airship have been obtained and could be increased by the use of larger aerials at the receiving stations, if any good purpose would be served thereby.

The members heard a gramophone in action at Aperfield Court, 20 miles away, and communication was next established with aeroplanes sent up from Biggin Hill aerodrome. After some jamming the observer on a Nieuport machine was heard to state that he could hear everything sent to him, that he was then approaching the river, and that he could not yet see the Houses of Parliament. General Seely invited the observer and pilot to dine with him at the House of Commons, and asked that the same invitation might be communicated to other aeroplanes in the air within 20 miles. Some other machines were then picked up and requested to give their positions.

Another part of the demonstration concerned direction-finding by wireless for the navigation of aircraft and an inter-communication telephone was also shown by General Seely.

# EXPERIMENTAL DESIGN AND TESTING OF AEROPLANE RIBS\*

BY GEORGE B. FULLER AND LESSITER MILBURN.

The function of the rib in an aeroplane is to carry the load with the least possible distortion and with the proper factor of safety.

Inasmuch as no mathematical solution is readily applied to the average aeroplane rib, a method of experimental design was adopted to produce a rib which should meet the requirements with the least possible weight, and at the same time utilise the least possible time, labour and material expense in production.

The aeroplane rib is, at best, a very light and non-rigid member. The rib shown in Fig. 1 has a 94-in. chord, is  $\frac{1}{2}$  in.

used after the first five tests, to give the most severe condition.

Bearing in mind the above conditions of loading and methods of fastening, there were some five methods of applying the load to be considered, as follows:—

1. A system of equalising levers, linked together, which would distribute the load over the rib, the lengths of the levers being proportioned to give proper loads at the points required.

2. A system of loading the rib, through rubber bands of varying strength, to agree with the load-grading curve.

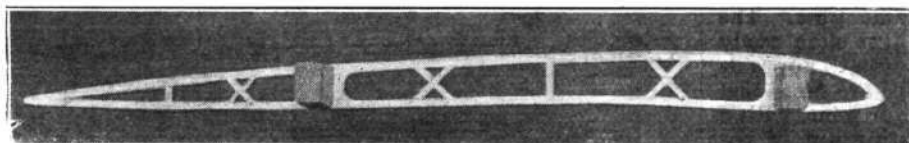


Fig. 1.—The final rib selected from the results of the tests has a chord of 94 ins., weighs 11½ ozs., and carries an ultimate load of not less than 555 lbs.

wide, weighs 11½ oz. and carries an ultimate load of not less than 555 lbs. This rib was the final selection from the results of a series of tests made upon ribs of various types which were designed by approximate mathematical methods.

The conditions demanded of a rib-testing machine follow:—

1. A rib-testing machine should hold the rib and apply the load in the same manner as the air load when the rib is in the wing.

2. The distribution of the load along the chord must not vary from the predetermined load grading when the rib deflects as the load is applied.

3. The machine should be so arranged that the load may be varied from zero to the breaking load, and an accurate means of measuring the load at any point must be provided.

3. A system of springs used in the same manner as the rubber bands.

4. A system of hydraulic cylinders, the area of each being proportional to the load, as taken from the load-grading curve at the particular point, all having the same pressure.

5. A system of levers resting on knife edges, each lever being independent of any other and having its own load applied in a pail, or the like.

After a number of sketches had been made and the points of advantage and disadvantage of each of the above methods fully considered, the fifth or last method was adopted and used in all the following tests.

## Description of the Machine Used

The machine was constructed of wood, with a platform at about the height of a man's arm, on which the rib was to be placed. Guides of  $\frac{3}{4}$ -in. pipe were secured to the platform to maintain the rib in a vertical position. At the rear of the platform knife edges were mounted on a horizontal beam. Over these knife edges 20 ash levers were set, each having a metal plate to take the knife edge. Both ends of these levers were cut in the form of an arc, having the centre at the knife edge, so that the lever ratio was always the same. At the rear end of each lever a pail was attached and the front ends were connected to the stirrups by wires. The lower end of the wire was slipped through the stirrup, bent up and secured with a small washer so that the stirrups could be readily fastened to the wires. The distance from one stirrup to the next was 4.7 ins. Each lever was counterbalanced with a weight, so that when the pails were empty the lever rested evenly on the knife edge.

To reproduce the condition of non-rigid support of the ribs mentioned above, the test ribs were made up on dummy spars as shown in Fig. 1. Two U-bolts were passed over each spar and connected to the floor by steel cables, leaving the spars free to move without respect to each other.

## Method of Loading

The load may be applied by putting either water or sand in the pails. When the machine was designed it was intended that a water load be used. A tank was to be placed over the loading pails with 20 lines of hose, one leading to each pail. In the end of each hose a nozzle was placed having an exact diameter and calibrated for various heads. The diameters were such that the water would flow into the pails according to the ratio established from the load grading curve. The flow of water was to be controlled by a gate valve operating on all the lines of hose at the same time.

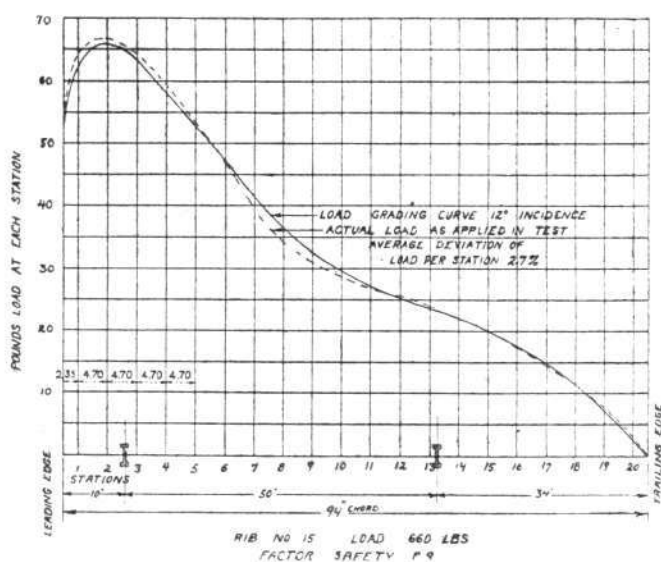


Fig. 2.—Curve showing the distribution of load along the rib

4. An accurate means of measuring the distortion of the rib under load should be provided.

As the load on the rib varies continually with the varying angle of incidence of the wing, the most severe case was chosen. The supports of the rib, also, are not all the same. At or near the drift struts the ribs may be said to have a



Fig. 3.—Rib section to scale obtained by tracing photograph showing total deflection under distributed load

fixed or rigid support, while near the centre of the bay, the rib supports may be considered as not being fixed, due to the spring of the beam. In these tests a non-rigid support was

\* Courtesy Automotive Industries, N.Y.

On account of delay in securing apparatus for water loading, sand loading was substituted. A small measure was made for each of the load pails, and the capacity of each cup was so proportioned that when one round of cups of sand had



been poured into the pails the pull on the stirrup was in agreement with the load-grading curve chosen.

In order that the size of pail used would not be too large it was necessary to adopt three ratios of leverage for the levers. Beginning with the leading edge of the rib, the first six levers were made with a ratio such that the pull on the stirrup was three times the load in the pail. The next seven levers had a ratio of two to one, and the last seven, one to one.

### Operation of the Machine.

The rib being assembled and secured to the dummy spars ready for test, 20 small grooved blocks were tacked along the lower edge as seats for the stirrups, to prevent crushing of the cap-strip and to simulate the sewing of the fabric to the rib, as done in the wing. The rib was placed on the platform of the machine, between the guides and the stirrups were attached to it. The stirrups were then attached to the levers, and the balance of the levers checked as a precaution. The four U-bolts were put on and connected to the steel cables leading to the floor, the lengths of the cables being adjusted so that all four would become taut at about the same time. The guides were fastened so that the rib would just slide easily between them. The purpose of these guides was to approximate the condition in the wing, where the ribs are cross-tied with tape and sewed through the wing every 2 or 3 ins. with a stout linen cord to prevent them from twisting out of the vertical.

One round of cups or measures of sand of a fine, dry grade was placed in the loading pails to take up all slack in the wires, cables and stirrups. The total load on the rib at the end of one round was 41 lbs., distributed in this case according to the load-grading curve shown in Fig. 2. A steel scale was placed at the centre of the rib and a reading point selected and marked on the rib-web.

A second round of cups was then poured into the pails, and a reading taken on the scale, for the purpose of comparing the relative rigidity of various ribs. The loading was continued by rounds until failure occurred, the contour and the weak points of the rib being carefully observed meanwhile, together with the readings for rigidity. At stated points during the loading—as, for instance, at normal load, at two, four, six, or eight times normal load—photographs were taken of the rib. By comparing tracings, made from these photographs with the natural, free outline of the rib, an accurate measure of the rib contour under stated loads was obtained.

When the rib failed, the point and probable cause of failure were noted. After failure, the amount of sand in each load pail was carefully determined, and the weight recorded with the pail number. From these weights, the total load on the rib was checked, and also the distribution of the load by means of a curve, plotted with the loading points as *abscissæ*, and the pail weights as *ordinates*. This curve will have the same form as the load-grading curve, if the test has been properly carried out.

The time required for test was three to five minutes, which was the disadvantage of using sand, instead of water. The water load can be applied in any time, down to about 15 seconds, by enlarging the orifices in the nozzles, or increasing the water-head.

After test, the rib was removed from the machine, detached from the dummy beams, and weighed in fractions of an ounce.

### Progress in Design

The method of experimental design is at best a "cut and dry" method. The first five ribs were designed by approximate mathematical methods. All the others were an evolution from them by making a study of the action of the rib during the test to destruction, and either making the weak section stronger, and the strong sections lighter, or by re-designing the various details of the rib which failed, or showed extra strength, to secure the desired results.

Ten types of ribs were experimented with, nine of which are shown in Fig. 4, the tenth being the well-known Handley-Page type of rib. Thirty-four ribs were made and tested before a satisfactory rib was produced. Since production has been in progress, a number of tests have been made which are not shown in the table.

All the ribs tested were loaded according to the air loading shown in Fig. 2. This chart also shows an average typical loading, the result of a test, and gives a good idea of the small error in the loading by this method of testing. While this error may seem to be large at some stations along the chord of the rib, it is known by actual weight, and no interpolation is necessary to find the load at any station.

The following table gives a complete analysis of this difference between the sand loading and the air load curve selected. The average difference over the stations is 0.78 lb. The average difference in per cent. is 2.7, and appears largely to be due to the loading at station 20. If we neglect station 20, the average per cent. of error is 1.8 per cent. instead of 2.7 per cent.

### Types of Ribs Tested

The large table illustrates the various types of ribs designed and tested, and gives a complete detail of each rib as to material used and the dimensions.

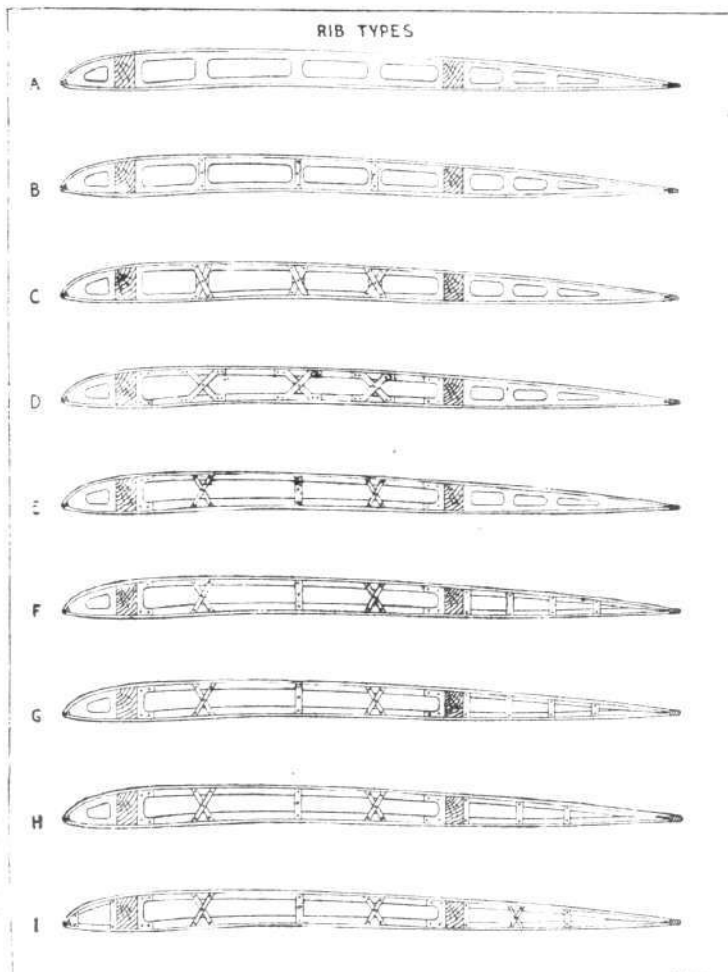


Fig. 4.—Various types of ribs tested. The reference letters are those used in the accompanying table

Type "A" was designed along the standard type of rib generally used. It had a  $\frac{3}{16}$ -in. birch veneer web with the grain of the outer ply running horizontal. The cap-strips were  $\frac{3}{16}$  by  $\frac{1}{8}$  in. selected spruce.

Type "B" is the same as type "A," except that reinforcements were put on the web to prevent buckling. Ribs 2 to 8, inclusive, were of this same type and material, 7 and 8 being a little heavier than the others. These ribs also showed a strong tendency to bend in the horizontal portion of the rib at each portal near the vertical portion of the web.

Type "C" is the same general design as type "B." The web in the centre, nose and tail sections being of  $\frac{3}{16}$ -in. thick spruce instead of  $\frac{3}{32}$ -in. veneer. The "X" bracing was put on the web between each portal. In the tests this prevented the shearing of the webs and leads to the next type.

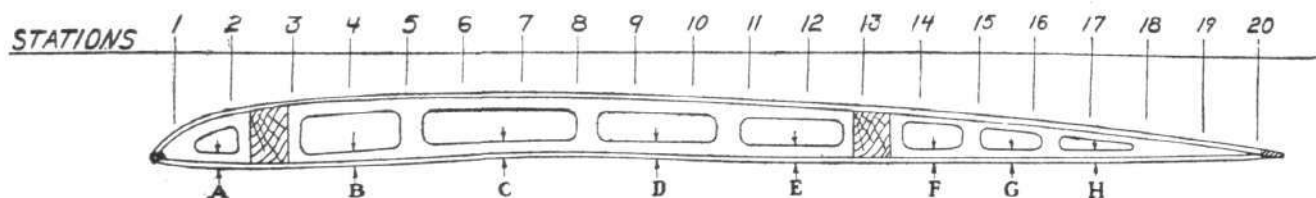


Fig. 5.—Diagram of rib, showing stations and other items referred to in the accompanying table



# Results of Tests on Aeroplane Ribs conducted in the Glenn L. Martin Laboratory.

Rib No.	Type.	Web (Between Beams).										Portals.	Tail.	Nose.	Capstrip-Spruce, by	Beams Fastened.	Weight, oz.	Load total, lbs.	Factor of safety.	Inches Total Deflection Divided by $\frac{F.S.}{2}$	Failure.		Remarks	
		Material.	Grain.	A.	B.	C.	D.	E.	F.	G.	H.										Station.	Cause.		
1	A	$\frac{3}{8}$ birch veneer	Horizontal	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	Cut out horizontal grain	$\frac{3}{8}$ veneer	..	$\frac{3}{8}$ veneer	$\frac{3}{8}$ plain	Rigidly	358	4.8	—	9-bottom	Shear	Method of fastening true only for ribs close to box ribs and drift struts.	
2	B	$\frac{3}{8}$ birch veneer	Horizontal	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	Cut out, horizontal grain, with vertical side-strips	$\frac{3}{8}$ veneer	..	$\frac{3}{8}$ veneer	$\frac{3}{8}$ set-in	Rigidly	15	624	8.4	.077	12-bottom	Bending	Method of fastening true only for ribs close to box ribs and drift struts.
7	B	$\frac{3}{8}$ birch veneer	Horizontal	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	Cut out, horizontal grain, with vertical side-strips	$\frac{3}{8}$ veneer	..	$\frac{3}{8}$ veneer	$\frac{3}{8}$ set-in	From floor	16	383	5.2	.104	11-bottom	Shear	Humps over portals for last third of load.
8	B	$\frac{3}{8}$ birch veneer	Horizontal	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	Cut out, horizontal grain, with vertical side-strips	$\frac{3}{8}$ veneer	..	$\frac{3}{8}$ veneer	$\frac{3}{8}$ set-in	From floor	16	322	4.4	.094	13-bottom	Shear	Veneer had diagonal grain at point of failure.
9	C	$\frac{3}{8}$ spruce	Horizontal	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	Cut out, horizontal grain, with X side-strips	$\frac{3}{8}$ spruce double-side strips	..	$\frac{3}{8}$ spruce cut-out	$\frac{3}{8}$ set-in	From floor	19 $\frac{1}{2}$	350	4.7	.061	Portals	Shearing	Turning moment between upper and lower sides sheared portals.
10	B	$\frac{3}{8}$ veneer	Vertical	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	Cut out, vertical grain, with double vertical side-strips	$\frac{3}{8}$ veneer vertical grain	..	$\frac{3}{8}$ veneer vertical	$\frac{3}{8}$ set-in	From floor	16 $\frac{1}{2}$	274	3.7	.135	11-bottom	Bending	Sharp failure.
12	B	$\frac{3}{8}$ veneer	Vertical	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	Cut out, vertical grain, with double vertical side-strips	$\frac{3}{8}$ veneer vertical grain	..	$\frac{3}{8}$ veneer vertical	$\frac{3}{8}$ set-in	From floor	16 $\frac{1}{2}$	275	3.7	.136	11-bottom	Bending	Sharp failure.
13	C	$\frac{3}{8}$ spruce	Horizontal	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	Cut out, horizontal grain, with X side-strips	$\frac{3}{8}$ spruce double-side strips	..	$\frac{3}{8}$ spruce cut-out	$\frac{3}{8}$ set-in	From floor	18 $\frac{1}{2}$	600	8.1	.053	8-top gusset	Bending	Shape good to 450 lbs., then humped in centre (secondary failure at Sta. 13).
15	B	$\frac{3}{8}$ veneer	Horizontal	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	Cut out horizontal grain, with double vertical side-strips	$\frac{3}{8}$ veneer horizontal grain	..	$\frac{3}{8}$ veneer horizontal grain	$\frac{3}{8}$ set-in	From floor	20 $\frac{1}{2}$	660	8.9	.050	8-bottom gusset	Bending	Humps over central portals.
16	B	$\frac{3}{8}$ veneer	Horizontal	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	Cut out horizontal grain, with double vertical side-strips	$\frac{3}{8}$ veneer horizontal grain	..	$\frac{3}{8}$ veneer horizontal grain	$\frac{3}{8}$ set-in	From floor	20 $\frac{1}{2}$	868	11.7	.047	13-bottom gusset.	Shear	Shape good throughout, failure sharp.
17	B	$\frac{3}{8}$ spruce	Horizontal	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	Cut out horizontal grain, with double vertical side-strips	$\frac{3}{8}$ spruce, no side strips	..	$\frac{3}{8}$ spruce	$\frac{3}{8}$ set-in	From floor	18 $\frac{1}{2}$	459	6.2	.048	14-tail	Bending	Tail portals weak without side-strips. Tail portals sheared at about half load.
18	C	$\frac{3}{8}$ veneer	Horizontal	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	Cut out horizontal grain, with single X side-strips	$\frac{3}{8}$ veneer, no strips	..	$\frac{3}{8}$ veneer	$\frac{3}{8}$ set-in	From floor	15 $\frac{1}{2}$	378	5.1	.077	9-10 bottom	Local	Central X portals weak, and crumpled under eccentric load.
19	D	$\frac{3}{8}$ spruce	Horizontal	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	Built up spruce $\frac{1}{2} \times \frac{3}{4}$ single X, wrapped and doped	$\frac{3}{8}$ veneer, no strips	..	$\frac{3}{8}$ veneer	$\frac{3}{8}$ set-in	From floor	19 $\frac{1}{2}$	662	9.0	.072	5-top	Bowing of portal	Central X portals weak, and crumpled under eccentric load. Portals bowed out at about 425 lbs. load.
20	D	$\frac{1}{2}$ spruce	Horizontal	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	Built up $\frac{1}{2} \times \frac{3}{4}$ veneer, double X, wrapped and doped	$\frac{3}{8}$ veneer, no strips	..	$\frac{3}{8}$ veneer	$\frac{3}{8}$ set-in	From floor	17	637	8.6	.046	5-top	Bowing of portal	Front portal crumpled inward at about 575 lbs. load.
21	D	$\frac{1}{2}$ spruce	Horizontal	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	Built up $\frac{1}{2} \times \frac{3}{4}$ spruce double X, wrapped and doped	$\frac{3}{8}$ veneer, no strips	..	$\frac{3}{8}$ veneer	$\frac{3}{8}$ set-in	From floor	16	703	9.5	.041	5-top, web and cap	Local	Humps over portals. X portals had a $\frac{1}{2}$ -in. block at their cross points to bow them out in centre.
22	E	$\frac{1}{2}$ spruce	Horizontal	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	Built up $\frac{1}{2} \times \frac{3}{4}$ spruce double X, & vertical	$\frac{3}{8}$ veneer, no strips	..	$\frac{3}{8}$ veneer	$\frac{3}{8}$ set-in	From floor	14	533	7.2	.046	12-web bottom	Split	$\frac{3}{8}$ mahogany veneer beam gussets. Beam brace blocks partially cut away.
24	F	$\frac{1}{2}$ spruce	Horizontal	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	Built up spruce $\frac{3}{4} \times \frac{1}{2}$ double X, & vertical	3 vertical spr. portals	..	$\frac{3}{8}$ spruce	$\frac{3}{8}$ set-in	From floor	13 $\frac{1}{2}$	624	8.4	.044	4-5 bottom	Shear	
25	F	$\frac{1}{2}$ spruce	Horizontal	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	Built up spruce $\frac{3}{4} \times \frac{1}{2}$ double X, & vertical	3 vertical spr. portals	..	$\frac{3}{8}$ spruce	$\frac{3}{8}$ set-in	From floor	12 $\frac{1}{2}$	610	8.2	.046	5-bottom web	Splitting	Horizontal spruce beam gussets.
26	G	$\frac{1}{2}$ spruce	Horizontal	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	Built up spruce $\frac{3}{4} \times \frac{1}{2}$ double X, & vertical	3 vertical spr. portals	..	$\frac{3}{8}$ spruce	$\frac{3}{8}$ set-in	From floor	13	509	6.9	.047	3-bottom web	Splitting	Vertical spruce beam gussets.
28	H	$\frac{1}{2}$ spruce	Horizontal	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	Built up spruce $\frac{3}{4} \times \frac{1}{2}$ double X, & vertical	2 vertical spr. portals	..	$\frac{3}{8}$ spruce	$\frac{3}{8}$ set-in	From floor	11 $\frac{1}{2}$	626	8.5	.046	3-4 bottom web	Splitting	Tail took strong crescent shape. $\frac{3}{8}$ mahogany veneer beam gussets.
29	H	$\frac{1}{2}$ spruce	Horizontal	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	Built up spruce $\frac{3}{4} \times \frac{1}{2}$ double X, & vertical	2 vertical spr. portals	..	$\frac{3}{8}$ spruce	$\frac{3}{8}$ set-in	From floor	11	665	9.0	.041	14-tail	Bending	Tail took strong crescent shape. $\frac{3}{8}$ mahogany veneer beam gussets.
30	I	$\frac{1}{2}$ spruce	Horizontal	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	Built up spruce $\frac{3}{4} \times \frac{1}{2}$ single X, & vertical	Spruce, single X & vertical	..	$\frac{3}{8}$ spruce	$\frac{3}{8}$ set-in	From floor	11 $\frac{1}{2}$	546	7.4	.046	3-4 bottom	Shear	$\frac{3}{8}$ mahogany veneer beam gussets.
32	Hand. Page	$\frac{1}{2}$ spruce	Horizontal	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{3}{8} \times \frac{1}{2}$ vertical spruce, with diag. tension strips	..	..	$\frac{3}{8}$ set-in	From floor	10	436	5.9	.037	3-tension strip	Torn loose		
33	Hand. Page	$\frac{1}{2}$ spruce	Horizontal	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{3}{8} \times \frac{1}{2}$ vertical spruce, with diag. tension strips	..	..	$\frac{3}{8}$ set-in	From floor	10	370	5.0	—	3-tension strip	Torn loose		
34	Hand. Page	$\frac{1}{2}$ spruce	Horizontal	Rib No. 33	was re-built	with screws, but did not show fair test	..	..	..	..	..	..	..	..	..	..	..	10	250	..	—	3-web split	..	
35	I	Made in production, same as Rib No. 30, Type I.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	From floor	12	615	8.3	.035	4-bottom	Bending	
36	I	Made in production, same as Rib No. 30, Type I.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	From floor	12 $\frac{1}{2}$	451	6.1	.050	5-top	Splitting	Web at 4, 5, 6 had diagonal and spiral grain.

Type "D" is similar to type "C," except that the portalled web is replaced by the "X" brace of veneer and a thin strip of spruce next to the cap-strip shaped to conform to the curve of the wing section, this strip with the cap-strip forming a "T" section. The cap-strips were reduced from  $\frac{3}{8}$  by  $\frac{1}{8}$  in. to  $\frac{1}{8}$  by  $\frac{1}{8}$  in. and again to  $\frac{1}{8}$  by  $\frac{1}{8}$  in.; also the web thickness has been reduced from  $\frac{3}{8}$  to  $\frac{1}{8}$  in. thick. The shape of the "X" brace will be seen. It was taped and doped to prevent any shearing tendency. Veneer gussets  $\frac{3}{8}$ -in. thick on both sides of the web next to the beams are used to take up part of the bending. From the table it will be noted that the size of the cap-strips is  $\frac{1}{8}$  by  $\frac{1}{8}$  in., and that the central "X" brace was replaced with a vertical brace. This now makes two sets of "X" bracings in the centre section. It might be noted here that the "X" bracing and the single-vertical bracing are double, one on each side, separated by a block  $\frac{1}{8}$  by  $\frac{1}{8}$  by  $\frac{1}{8}$  in.

Type "F" is a marked departure from all previous types in that the portalled section at the rear of the rear beam is replaced with a built-up section similar to the centre section. Vertical grain spruce gussets were substituted for the veneer gussets next to the beams on the central section.

Type "G" is the same as type "F," except that horizontal grain spruce gussets were used instead of the vertical grain. On trial the spruce gussets proved to be unsatisfactory. Type "H" has veneer gussets on the central section, but had only two verticals in the tail section, and, as in type "G," the tail section took a marked crescent shape showing the necessity of an "X" brace to take the shear.

Type "I" is similar to type "H," except that it has one "X" brace in the tail. The section in front of the front beam is built up of strips similar to the centre and tail sections. This type of rib is the one used in all aeroplanes so far produced by the Glenn L. Martin Co. It is made entirely of spruce, except for the four small gussets, next to the wing spars, which are  $\frac{3}{8}$ -in. veneer.

Only two ribs of the Handley Page type rib were made and tested. At this time it was decided not to carry the experiments any further, but to use type "I" rib, as it made a very good production job, and was found to be equally strong for normal flight as well as for upside down flying.

Since the table was made, a large number of tests have been made on the type "I" rib, as made in production. These tests were made with the load-grading, as shown in Fig. 2, and the load grading as specified by the Army in sand loading of wings. These tests are not only for the standard rib, but for the rib in the section of the wing with the aileron cut out.

It will be noted that the weight of the various ribs started in at 15 oz. and ran as high as 20½ oz. The average weights of ribs in production is 11½ oz.

The cost of manufacture of this rib as produced is much less than the standard type using veneer for the webs and cutting out various shaped portals.

All tests were made with certified glue, but later some ribs were built up with cold glue, and apparently there was no difference in the results. But in production only certified hot glue is used.

The deflection in the table is given for each load of factor of safety of one, and is a convenient indication of rigidity. It is seen that the final type of rib held its original shape the best and that the aerodynamic characteristics will not be appreciably changed in normal flight. In the table on page 1081 the deflection is shown for the centre section. Space hardly permits of any more detail information on this.

Fig. 3 shows the contour of the rib, and the dotted outline shows rib No. 31 with a load eight times normal load. The total deflection is  $\frac{23}{32}$  in., or 0.043 in. deflection for normal load.

Station—	Readings from		Actual Weight.	Difference in Weigh.
	Load Grading	Curve.		
1..	..	61.80	64.2	2.4
2..	..	65.80	66.2	1.0
3..	..	63.40	64.2	0.8
4..	..	57.79	58.5	0.51
5..	..	52.95	53.5	0.55
6..	..	47.35	47.0	0.35
7..	..	41.35	39.5	1.85
8..	..	36.52	34.0	2.52
9..	..	32.50	31.0	1.50
10..	..	29.28	28.5	0.78
11..	..	27.28	26.8	0.48
12..	..	25.27	26.0	0.73
13..	..	23.67	24.0	0.33
14..	..	22.06	22.0	0.06
15..	..	20.06	20.0	0.06
16..	..	17.25	17.2	0.05
17..	..	14.84	14.2	0.64
18..	..	10.83	11.0	0.17
19..	..	7.62	7.3	0.32
20..	..	2.51	3.0	0.49
		660.13	658.5	15.59

Average difference in weight, 0.780 lb.  
Tabulated loadings as shown in Fig. 2.

## General Sykes Flies to Amsterdam

MAJ.-GEN. SIR F. H. SYKES, Controller-General of Civil Aviation, on the invitation of the Executive of the Amsterdam Aircraft Exhibition, started from Felixstowe on August 12 by flying boat for Amsterdam, where he arrived at 1.14 p.m. (B.S.T.).

Three additional flying boats accompanied that carrying Gen. Sykes, and the convoy set out for Scheveningen.

The intention was that the four flying boats, each of which flew the Union Jack, should circle the Exhibition three times before landing at the Naval Station at Schellingwoude.

## The Air Ministry

It is announced by the Air Ministry that the Marquess of Londonderry, Finance Member of the Air Council, has appointed Mr. E. F. Cliff to be his private secretary, vice Capt. Lord E. A. Grosvenor, R.A.F., with effect from July 22, 1919.

## Marks on Aircraft

ATTENTION is drawn to the Secretary of State's order published in the *London Gazette*, of August 1, which, in the usual official wording, makes a small alteration in the method of marking aircraft.

Under the Regulations published on April 30, the marks of civil aircraft were to be underlined with a black line; the International Air Convention reserves this black line for one particular type of aircraft, i.e., the private or tourist aircraft, as opposed to the commercial or State machines. The order published in Friday's *Gazette* thus brings our Regulations into line with the International Convention in this respect.

## R.A.F. and the British War Medal

THE Air Ministry makes the following announcement:—A preliminary issue of 2 inches of the riband will be made to all Air Force personnel who are entitled to the British War Medal, on the understanding that such issue does not confirm the title of the recipient to the subsequent award of the medal.

In view of the numbers entitled to participate in the issue, some considerable time must necessarily elapse before the issue is completed. Every effort is, however, being made to accomplish this as soon as possible.

Officers demobilised or invalided should make application to the Secretary, Air Ministry, stating full particulars of their services.

Discharged and demobilised airmen should apply to the Officer i/c Records, R.A.F., Blandford, as follows:—

(a) Those resident in Great Britain, Ireland, Channel Islands and Isle of Man, on the special R.A.F. post-card (F.S. Form 758), obtainable at any post office. The Army post card (Army Form W 5100A) will not be accepted, neither will any other form of application.

(b) Those resident abroad, by an ordinary letter giving full particulars regarding official number, rank, unit in which last served and the address to which the riband should be sent.

Discharged and demobilised members of the W.R.A.F. should apply by letter giving full particulars of their service, to the Officer i/c W.R.A.F. Records, 15, St. George's Square, S.W. 1.

Members of women's formations who have been employed under a direct contract of service with the R.A.F. Medical Service should apply to the Secretary (D.M.S.), Air Ministry.

Officers and men of the R.N.A.S. who were discharged prior to April 1, 1918, and those who did not transfer to the R.A.F., will be dealt with in an Admiralty announcement, which will be published in due course.

## Francis Mond Professorship of Aeronautical Engineering

THE Vice-Chancellor of Cambridge University announces that the election of a Francis Mond Professor of Aeronautical Engineering will take place at 3 p.m. on Friday, September 26, at the University Offices, St. Andrew's Street, Cambridge.

Candidates for the vacant Professorship are requested to communicate with the Vice-Chancellor, and to send such evidence as they may desire to submit to the Electors, on or before Friday, September 19.



# AIR MINISTRY METHODS

THE SELECT COMMITTEE ON NATIONAL EXPENDITURE have made further progress in the matters to them referred, and have agreed to the following THIRD REPORT:

## THE AIR MINISTRY.

1. The Sub-Committee on the Air Ministry have continued their investigations and have met 11 times and examined 29 witnesses.

### CONTRACTS.

2. The Sub-Committee examined Sir John Hunter, K.B.E., Administrator to Works and Buildings. Asked as to the work at Halton Park, he informed them that the work was commenced in 1917, but, pending consideration of the future programme of the Air Ministry, the works generally had been stopped. Asked if he could give any explanation of the reason why such enormous wages were paid by the Contractor, the witness stated that it was all settled by the Government, that there was no person who had written more strongly than he had done on the subject and that he was of opinion that no man who had been employed on the erection of aerodromes had earned the money he had received.

Asked how many men would be covered by that statement, he replied: The whole lot—70,000 of them. Asked whether that was not rather a sweeping assertion to make, he replied that he was speaking in a general fashion.

3. Asked whether he had come across any cases of fraud in relation to the carrying out of contracts, he replied that he had, and that there was a conspiracy in which one Government man and three contractor's men were concerned.

4. The witness was asked to give particulars of the cases to which he referred, and the following is an extract from a letter, dated June 18, 1919, which he sent to the Sub-Committee:—

"In reply to your letter of the 17th instant, asking for particulars of fraud in connection with my work at the Air Ministry, I give you some notes of prosecutions. The Renfrew one is the most serious, where I found a conspiracy of Government men and contractor's men, and I suspected the contractor was also in it. I had four men arrested, and they have been on bail each for £100 for the past four months, but the Crown Authorities declined to prosecute, and the men were freed from the charge on June 7. I am, however, arranging a Civil action against the contractor for roughly £50,000, less the money we have in hand belonging to him for commission on work done."

5. He further stated on examination that there was another official of the Air Ministry concerned. The Sub-Committee questioned the witness as to the reasons why the Crown Agent authorities refused to prosecute, and the following letter addressed to the Secretary, Air Ministry, from Mr. Millar Craig, Secretary to the Lord Advocate, was put in:—

"March, 6, 1919.

"Sir,—With reference to your telegram of December 9 last to the Crown Agent, and confirmation thereof (No. A. 8924 (CL), regarding fraudulent practices in connection with contracts for Renfrew Aerodrome, I am directed by the Lord Advocate to inform you that after full enquiry and consideration he does not see his way to order a prosecution.

The evidence available is insufficient to afford any strong probability of obtaining a conviction. There is no evidence at all that any of the accused applied to their own uses any of the money said to have been improperly obtained from the Ministry. This circumstance, though it does not in itself provide an answer to a charge of fraud, makes the insufficiency of the evidence more formidable than would otherwise be the case. Further, a prosecution would reveal what appears to be inefficiency and absence of control on the part of the representatives of the Ministry on the spot.

"In view of these considerations, his Lordship regrets that he cannot come to any other decision than that intimated above."

6. On receipt of that letter, the witness addressed the following remarks to the Secretary of the Air Ministry:—

"I have read the attached letter from the Lord Advocate with the greatest surprise, and I think that it is absolutely necessary that he should be asked at once to give further consideration to the question of prosecuting the persons now charged with offences at Renfrew. I wish to point out at the outset that I as Administrator of Works and Buildings, am the person responsible for the work done at Renfrew Aerodrome, and that this whole question of prosecuting the men now charged arose through discoveries which I made, and it is I who have been pressing for this prosecution, after consultation with Lord Weir, the late Secretary of State for the Air Force, and with his approval. Any question, therefore, of the possible effects of the prosecution in revealing inefficiency and lack of control on the part of representatives of this Department on the site should be ignored altogether. As the person most affected, I cannot concur in the view that such a question should be allowed to affect the legal question in the case.

"I find it very difficult to understand how a criminal charge cannot be formulated and a conviction obtained, having regard to the admissions made, and in some cases signed by persons charged.

"It is admitted that the books or time sheets were falsified by entering thereon the names of men said to be employed on the job, but who did not, in fact, exist. Wages were drawn regularly and charged to the Government as having been paid to these men. Where did that money go? The Lord Advocate says there is no evidence that any of the accused applied 'to their own uses any of the money said to have been improperly obtained from the Air Ministry.' But would not any jury on the facts above stated draw the obvious inference that the persons responsible for putting these 'dead men' on the books and drawing wages regularly for them from Government funds had, in fact, put the money in their own pocket? And is there not evidence that this was done with the connivance of the Clerk of Works?

"But I wish to carry the matter further and to point out that the position if no prosecution is attempted, is in my opinion more serious for the Air Ministry than if a prosecution should be started and fail, and I wish to explain the position so that it may be put before the Lord Advocate.

"After a personal enquiry, on making the discovery of these irregularities, I informed the contractors that I would not authorise payment to them of commission in accordance with the terms of their contract, but would have the whole job measured up and pay them on such measurement on proper rates.

"Mr. Cowieson (the head of the firm of contractors), at an interview which I had with him and his Law Agent, agreed to this, and later agreed by letter. I attach copies of letters which passed between us after that interview.

"A firm of measurers was engaged by me, and their work is now practically complete, and it appears that already there is a sum of about £60,000 charged by the contractors to the job which cannot be accounted for.

"If the suggested proceedings against the officials are now dropped, what is the position of the Government and myself with regard to the contractor? I can see that the Air Ministry will be placed in a very objectionable position. Even if the prosecution should fail on whatever charge was formulated, the evidence must be such as to strengthen the position of the Government against the contractors and save money to the country.

"When the warrants were issued by the Procurator-Fiscal of Paisley against the men now charged, another warrant against—was also issued, but by arrangement with me no use has been made of this warrant up to the present time.

"It is suspected that materials delivered on the site were in fact diverted to private jobs of his, but up to the present there is no evidence which could prove this. You will see therefore that the matter is a very serious one, and in the interests of the Government should not be dropped unless it is absolutely certain that no charge can be framed for a prosecution against the individuals now under arrest.

"Will you please submit the matter again to the Lord Advocate and ask him to reconsider his opinion in the light of the facts above stated as I am very much perturbed by the contents of his letter. The matter is extremely urgent, as more than three months have elapsed since the men now charged were arrested, and I understand that the time for taking proceedings is fast running out."

Later the witness saw the Lord Advocate personally and he refused to alter his decision.

7. The Chairman of your Committee saw the Lord Advocate, and informed him that the Sub-Committee had received a copy of his letter to the Air Ministry, and later he wrote to the Lord Advocate and asked him if he would like to appear before the Sub-Committee and to give evidence as to his reasons for refusing to prosecute in the Renfrew case.

The Lord Advocate replied as follows:—

"July 11, 1919.

"Dear Banbury,—Yours of the 8th instant has reached me here in Edinburgh this morning.

"I cannot be in town until Wednesday morning of next week in any case, and my Department's letter speaks for itself.

I am, &c."

8. Sir John Hunter also informed us that he had applied to the War Office asking them to court-martial an officer employed by the Air Ministry on the same contract, whom he suspected of fraud, but that they refused to take any action, and informed him that he ought to take criminal proceedings.

9. Further evidence as to the placing of contracts was given by Miss O'Sullivan, the Clothing Controller of the W.R.A.F.

10. This witness stated that a contract had been given to a Manchester firm (Messrs. Cohen & Wilks) for 30,000 coat frocks and 30,000 overcoats without having been put up to competition. She informed the Sub-Committee that a pattern coat frock was sent in by this firm and by another firm (Messrs. Kenneth Durward) and that Messrs. Kenneth Durward's pattern was selected, the other firm's pattern being unanimously rejected by the Committee appointed to deal with the matter. Notwithstanding this the order was given to the latter.

11. She also stated that the deliveries of the article in question were dilatory and not up to sample, the garments being amongst other things badly cut.

12. By direction of Miss Douglas Pennant, who was then commandant of the W.R.A.F., the clothing controller went to Manchester and she stated that the coat frocks were being cut on the bias instead of on the straight; this course, if pursued would have resulted in the saving to the advantage of the contractor of about  $\frac{1}{4}$  yard on each garment. According to the contract, payment was to be made for 3 yards 24 inches of cloth on each garment.

13. The Sub-Committee sent for the Assistant Director of Army Contracts at the War Office, and asked him if it was correct that the contract had been given to the firm in question without having been put up to public competition. He replied that it was so. Asked for the reason for doing this, he replied that Major Cockburn of the Air Ministry had informed him that only a particular kind of cloth would be accepted by the Air Ministry, and the witness stated that no other firm was able to supply this particular cloth. The Assistant Director further stated that there was in addition considerable difficulty at that time in getting contractors to tender, as a very large amount of this class of work was being carried out for the Government.

14. Asked if he had taken any steps to obtain this kind of cloth from other people, he replied that he had asked the Director of Wool Textile Production at Bradford, to provide the cloth, but that this gentleman had replied that it was not possible to procure deliveries for commencement earlier than three to four months, and that the material would be piece dyed, price 9s. 6d. a yard.

15. Asked why it was that the firm in question could obtain material which the Director of Wool Textile Production, who was in control of the whole wool production of the country, could not obtain, he replied that he could not really answer, but that in his opinion it was a remarkable thing. He further stated that the firm in question were able to supply it at 7s. 7½d. a yard.

16. The Sub-Committee then examined Major Cockburn, especially on the question as to the reason why he informed the Assistant Director of Army Contracts that no other cloth than this particular sort would be accepted. His replies were so unsatisfactory that your Committee think it right to refer to them at some length.

17. The following questions were asked Major Cockburn:—

"Q. Did you refuse to accept any cloth for these coats and skirts except the particular cloth which this firm had?—A. No. I had no power to arrange anything of that sort. That is right outside my duty. I was the Q. Staff Officer.

"Q. I would rather you had answered my question?—A. My answer is—firstly, I did not; and secondly, if I had wanted to, it was not in my power to do so.

"Q. That is an important answer because the Assistant Director of Army Contracts has just told us you did do that?—A. I am afraid he is wrong.

"Q. The Assistant Director of Army contracts has stated that tenders were not invited for the contract with this firm for two reasons, 'one was that it was difficult to get any other firm, and the second was that Major Cockburn refused to accept anything but the pattern he had sent in,' and no one had any cloth of that pattern except this firm. Now you say that it is not true?—A. No, Sir, it is not true."

18. Later in his evidence the witness stated: "Now let me tell you why I recommended the gabardine from these contractors." Asked how that coincided with his previous answer, he stated that when he had said that this was the only cloth that could be accepted, he had nothing to do with it personally.

19. Major Cockburn was asked why the order was not given to Messrs. Kenneth Durward as their pattern had been selected. He replied that he could not say; that that was a contract matter which had not come under his purview. Asked why he did not inform the Assistant Director of Army Contracts that Kenneth Durward's pattern had been selected, he replied that the Assistant Director knew it, as he had the pattern down at the Royal Army Clothing Depot and had seen it, unless the witness was mistaken. The witness was then informed that his evidence on the above points was an absolute contradiction of that which the Assistant Director of Army Contracts had given.



20. The evidence of this witness on these points was sent to the Assistant Director of Army Contracts to ask him if he had any opinion to express on it. He replied that he would like to inform the Committee that his statement as to Major Cockburn's refusal to take other than yarn dyed cloth, like the sample provided by the Manchester firm, was based on the following note which appeared in official papers, dated May 23, 1918:—

"Spoke Major Cockburn, Air Board, who absolutely refuses to accept gabardine for this service, except as specified in Minute I."

He further said that he could only repeat that the Contracts Department, so far as he was aware, had no knowledge that any sample was made by the firm of Kenneth Durward, Ltd.

21. Miss Douglas Pennant stated that the removal of Miss O'Sullivan from the work of inspection was done behind her back. That she had an interview with Colonel Bersey and Colonel Latimer upon the subject, and came to an agreement that Miss O'Sullivan should continue the inspection with a representative of Colonel Latimer's.

A few days later, Colonel Bersey came into her room and asked her to sign a file at once; she asked to look at it before signing and found that it was an absolute reversal of the arrangement that had been made. That she then returned the file to Colonel Bersey and he wrote a minute in which he admitted that it was not on the lines as previously agreed.

The Sub-Committee have examined the file and find that it confirms Miss Douglas Pennant's statement.

Colonel Latimer, having previously stated that he had transferred the inspection part of Miss O'Sullivan's duties to someone else with the concurrence of Miss Douglas Pennant, was recalled. The statement that he had made was read to him, and he was asked if he still adhered to it. He replied, "Oh, absolutely." The file, which was signed by Colonel Bersey, was then shown him. The witness endeavoured to explain his answer, but the statements he made were utterly at variance with the file, and the Committee regret that they can attach no credence to them.

Miss Douglas Pennant having stated that Colonel Bersey was not anxious to assist her in discovering any irregularities, and that he did not want troublesome questions brought up, he was requested to attend before the Sub-Committee. He, however, did not put in an appearance, nor did he take any notice of the Sub-Committee's request. Time did not permit of steps being taken to compel his attendance.

22. Complaints were also made by Miss O'Sullivan, Captain Cherry and Lieut. G. Earl, officers in the W.R.A.F. Clothing Department, that they could not get copies of the contracts from Q.6 in which department Major Cockburn was employed, and of which Colonel Latimer was the head.

23. Miss O'Sullivan also said, in a statement put in, that the work of inspection which was being done by 40 men could be done by 12 women.

24. Your Committee examined Colonel Latimer, and being questioned on this point he replied as follows:—

Q. Did you ever use 40 men from the Labour Battalion to inspect clothing?—A. No, I do not think we ever did, because we selected men very carefully from Blandford, men of low category. We might have had men from the Labour Battalion for humping purposes, handling bales of clothing, and that sort of thing, but not for inspection.

Q. Why did you use men instead of women to inspect women's clothing?—A. You ask me a question I cannot answer. We used any labour that was available, men or women, or children even.

Q. Do men know much about women's clothing?—A. I suppose the majority of the stuff is made by men, and considering that is so, they should do.

Q. Did Miss O'Sullivan inform you that she thought 12 women could do this inspection, whereas you required 40 men?—A. Miss O'Sullivan made very many wild statements, and I believe that is one among them. I cannot recollect for certain. Q. You think it is one?—A. Very probably.

Q. Why was it a wild statement?—A. Because she could not possibly have done it. Q. Did you ever give her a chance?—A. No.

25. He also stated that copies of the contracts were always available for all persons authorised to have them. When shown files in which requests for copies of the contracts had been made and ignored in answers signed by himself, he said:—

"A. Well, no complaint was ever made to me as the head of that branch that they could never obtain contracts or anything they required."

"I was in constant touch with the Commandant of the W.R.A.F., and I specially arranged that she should be in direct touch. If there was anything wrong, there was no reason why they should lie down under it. They do not seem to have taken much trouble to get that."

Q. But surely, if they ask for them, it is your duty to supply them? What were you there for except to deal with those things that came to your notice?—A. I was there to take action against any subordinate who failed in his duty.

Q. Were you not there to see that your subordinates did their duty?—A. Yes, but not to dry-nurse them and to go round and follow them, and guide their hands and blot everything they wrote."

26. The Sub-Committee are of opinion that this witness's evidence was also unsatisfactory. Asked what useful functions his Department served, beyond being a "post office," he replied "very little."

27. Mr. John De Lange, confidential secretary to Messrs. Cohen & Wilks, attended and gave evidence. He stated that 6 ins. less cloth was used in the coats and skirts and 6 ins. more in the overcoats, and that this arrangement was approved by Mr. Hutchinson. Asked as to Miss O'Sullivan's statement as to the saving in cloth effected by cutting on the bias, he said he was not a practical man and could not answer. He also stated that to the best of his recollection Messrs. Cohen & Wilks had no cloth of this description on hand at the time the tender was given them.

28. The Sub-Committee examined Major-General Sir H. Trenchard (Chief of the Air Staff), and are of opinion that he is doing all that is possible to cut down expenditure while having due regard to the efficiency of his Department.

29. Your Committee are of opinion that a very unsatisfactory state of affairs has been revealed. In their opinion, when cases of negligence or of fraud have been discovered, action should be taken against the offenders, regardless of whether they are officials of the Department or not. They regret very much that the Lord Advocate should have taken up the position that he did.

30. In the case of Miss O'Sullivan, it would appear that she demanded an enquiry into the alleged irregularities as long ago as March last. An enquiry was not commenced until June, and then was not completed, Miss O'Sullivan refusing to sign the notes of her evidence. She was removed from the position of Clothing Controller, was given leave and informed that she would be demobilised, though this latter intention does not appear to have been carried out.

31. The Sub-Committee were informed by General Seely in a letter dated July 23, 1919, that the Secretary of State on his advice had decided to hold an inquiry into the irregularities alleged by Miss O'Sullivan.

#### FINANCE DEPARTMENT.

32. The Sub-Committee examined the Assistant Financial Secretary, and are of opinion that the Finance Department is very satisfactorily conducted, but that the position of the Assistant Financial Secretary should be greatly strengthened in order that Finance may exercise its proper influence. It is remarkable for instance that Finance is not represented on the Committee appointed by the Secretary of State to investigate and report on the changes

and reduction of the staff, and the redistribution of duties among the Departments necessitated by the reorganisation of the Air Ministry. Wherever financial consent is necessary before a proposal can be carried into effect the Assistant Financial Secretary is entitled to require full justification of the course proposed as being the most practicable and economical method of obtaining the required result. The Sub-Committee found that this has not always been the case in the Air Ministry. In particular they have observed a tendency in the Secretariat to usurp functions which belong properly to the Finance Department. As the responsibility rests ultimately with the accounting officer and his staff, such tendencies cannot but be prejudicial to the smooth working of the service.

#### MOTOR VEHICLES.

33. The Department have informed the Sub-Committee that the statement put in by them which appeared in our first Report, regarding the expenditure at Kennington Garage on motor cars, should have included the expenditure at the Belvedere Road Garage, where the heavy motor lorries are kept. They have put in a fresh statement showing the cost for the year ending March 31, 1919, as nearly as can at present be ascertained. Letter and statement below.

"Air Ministry, August 4, 1919.

"Sir,—Referring to your letter of the 30th ultimo, addressed to the Secretary, Air Ministry, on the subject of the cost of touring cars, I have the honour to request you to explain to the Select Committee on National Expenditure, that it has been found impossible, in the short time available, to prepare a complete statement, as required by your Committee, of the sum spent at Kennington and Belvedere Road from April 1, 1918, to April 1, 1919.

"The difficulty relates to the repairs and renewals, which have involved numerous issues of spare parts and materials of some 2,000 different kinds. The quantities of these items could be arrived at by scrutiny of all the issue vouchers, but as the articles are supplied by the Ministry of Munitions, it is necessary to rely on that Department for the prices, and I understand that the pricing can only be done by reference to the contracts, at a considerable cost of time and labour.

"I regret, therefore, that the cost of spare parts and material cannot be stated, with the exception of the cost of tyres, which has been ascertained. Every effort has been made to complete the return in all other respects, and I submit, for the information of your Committee, the enclosed Statement (A) of the cost of the Motor Transport Section at Kennington and Belvedere Road. The rates and taxes in Statement (A) include £1,001 for electricity, of which it is stated that at least 50 per cent. was used in connection with experimental work. The wages in Statement (A) include those of drivers, carpenters, labourers and other personnel at the Convoy and Despatch Section, Covent Garden, a unit controlled from Kennington, which deals with urgent issues to France. The total for the wages of this unit is stated to be £3,737.

"To arrive at the correct total for Motor Transport at Kennington and Belvedere Road a deduction should be made of £3,737 + £500 = £4,237.

"It has not been possible, in the time, to collect the figure for the maintenance and repair of buildings and plant.

"The difficulty of obtaining accurate figures has been much enhanced by the fact that the Kennington unit is in course of removal to Wormwood Scrubs.

"I beg also to forward Statement (B) showing the numbers and description of vehicles in April, 1918, and in March, 1919, and the numbers not in regular use. Side-cars are regarded as part of the motor cycles.

"Subject to the above remarks, I certify that to the best of my knowledge and belief the Statement (A) and (B) are correct.

"W. A. BLAND, Assistant Financial Secretary.

A.—Statement of Expenditure in Respect of the M.T. Section at Kennington and Belvedere Road for the Year April 1, 1918, to 31 March, 1919.

Rent .. .. .	1,300
Rates and taxes .. .. .	2,011
Pay and allowances of officers .. .. .	2,070
Pay of other ranks R.A.F. .. .. .	
Pay of W.R.A.F. .. .. .	36,190
Wages of civilians .. .. .	
Clothing and allowances of other ranks R.A.F. and of W.R.A.F. .. .. .	14,048
Oil, wick and carbide .. .. .	828
Tyres .. .. .	5,409
Petrol .. .. .	13,301
	£75,157

Deduct.—	
Electricity used for experimental work .. .. .	£500
Wages of employees at Covent Garden .. .. .	£3,737
	4,237

£70,920

Nothing is included in this Statement on account of spare parts (other than tyres) or materials used for repairs and renewals of vehicles; maintenance and repair of buildings and plant; or depreciation of vehicles.

B.—Schedule of Vehicles on Charge of the Motor Transport Section at Kennington and Belvedere Road.

	April, 1918.	March, 1919.
Crossley heavy tenders .. .. .	5	8
Crossley light tenders .. .. .	5	14
Ford vans or tenders .. .. .	4	17
Leyland float lorries .. .. .	5	8
Leyland platform lorries .. .. .	—	1
Crossley touring cars .. .. .	27	19
Ford touring cars .. .. .	13	19
Rolls-Royce touring cars .. .. .	1	2
Daimler touring cars .. .. .	1	1
Rolls-Royce limousine .. .. .	1	1
Rolls-Royce landaulettes .. .. .	1	4
Crossley landaulettes .. .. .	23	27
Ford landaulettes .. .. .	1	6
Motor cycles .. .. .	25	43
Ambulances (motor) .. .. .	2	3
Stellite two-seater cars .. .. .	1	—
Crossley limousine .. .. .	—	6
P. and A. heavy tenders .. .. .	—	9
P. and A. floats .. .. .	—	2
Tractors and trailers .. .. .	—	2
Lancia touring car .. .. .	—	1
Totals .. .. .	115	193
Motor cars out of use .. .. .	5	25
Motor cycles out of use .. .. .	1	5
Totals .. .. .	6	30

For the purpose of this statement side-cars are regarded as part of the motor cycles.

# Personals

## Casualties

Lieut.-Col. A. C. BODDAM-WHETHAM, D.S.O., 4th Battalion Argyll and Sutherland Highlanders and R.A.F., of Earlscliffe, Folkestone, who met his death in an accident in Palestine, had been appointed to go to Dasmascus to take up the work of finding landing stations for the air route to India, and was about to start from Ramleh, Palestine. After rising to a height of 1,000 ft. the engine missed fire. The pilot endeavoured to land at the aerodrome, but at about 100 ft. the machine appeared to side slip to the ground. The pilot was killed instantly, and Col. Boddam-Whetham died before reaching hospital. He was buried with full military honours in the military cemetery at Ramleh. Col. Boddam-Whetham served in the South African War, as well as in the war just ended.

Lieut. PHIL HALL-SMITH was killed on August 1, at the age of 30, at Leuchars Aerodrome, Fife, as the result of an aeroplane accident.

## Married

Maj. ALLAN DUNCAN BELL-IRVING, M.C., Croix de Guerre, Gordon Highlanders, R.A.F., was married on August 5, at Vancouver, B.C., to MARY E. KEITH FALCONER, daughter of Com. H. PYBUS, R.N.R., and Mrs Pybus, Vancouver, B.C.

Capt. PIERRE CLIFFORD CAMPBELL-MARTIN, M.C., Croix de Guerre, Sherwood Foresters, R.A.F., son of Mrs. A. E. Campbell-Martin, of Calcutta, India, was married on August 6 at the Church of the Holy Ghost, Nightingale Square, S.W., to MONICA, daughter of Mr. and Mrs. JOHN O'HEA, of 11, Endlesham Road, S.W.

Maj. BRUNO P. H. DE ROEPER, A.F.C., R.A.F., second son of Mr. and Mrs. de Roeper, of "Bella Vista," Upminster, was married on August 2 at Romford, to JEAN JULIA KEY, only daughter of Mr. and Mrs. W. Garbutt Key, of "Glen Caladh," Hall Lane, Upminster.

Lieut. HARRY MATHER, late R.F.C., eldest son of Walter Mather, Esq., Brierfield, was married on August 2 at St. Martin's-in-the-Fields, to CHOTEE, elder daughter of Lieut.-Col. G. F. A. WHITLOCK, C.B.E., R.E., 30, Winn Road, Southampton.

Surg.-Lieut. ARTHUR R. SHARROD, R.N., attached R.A.F., son of the late Mr. F. H. and Mrs. Sharrod, formerly of Cherrington Manor, was married on July 30 at the Parish Church, Wellington, Salop, to GWENDOLINE LANDER, younger

daughter of Mr. and Mrs. J. V. T. Lander, "Sunnycroft," Wellington.

Maj. H. G. TRAVERS, R.A.F., D.S.C., was married on August 6 at Ryton, near Shifnal, Salop, to HERMIA, younger daughter of Col. and Mrs. E. A. FRASER, of Bodicote Lodge, near Banbury, Oxon.

## To be Married

The marriage arranged between Capt. ALBAN SPENSER ELLERTON, O.B.E., R.A.F., and Miss MAUREEN GILLILAND HUSBAND, of 69, Belsize Park Gardens, will take place on September 13, at 11.30 a.m., at the Savoy Chapel.

The marriage arranged between Lieut. R. K. FLETCHER, late R.A.F., and RUTH, daughter of Mr. R. HALLPIKE, The White House, Croydon, will take place on August 25, at St. Matthew Church, Croydon.

The marriage arranged between Capt. STAFFORD BERKELY HARRIS, A.F.C., R.A.F., and Miss ENID CAMPION will take place at St. Jude's Church, Southsea, on August 21, at 2.15 p.m.

The marriage arranged between JAMES WALTER DOUGLAS MELHUISE, M.C., late 7th Worcesters and R.A.F., only son of Mr. T. W. W. Melhuish, M.I.C.E., and Mrs. Melhuish of Clifton Hill, Exeter, and DECIMA MARY TENISON, only daughter of Mr. and Mrs. Tenison Mosse, of Bank of England, Manchester, and grand-daughter of the late Hon. Alfred Ebdon, of Belmont, Rondebosch, Cape Town, will take place at 2 p.m. on August 14 at the Cathedral, Manchester.

The engagement is announced of Lieut.-Col. RUSCOMBE SMYTH PIGOTT, D.S.O., R.A.F., youngest son of the late Cecil Hugh Smyth Pigott and Mrs. Smyth Pigott, of Brockley Hall, Somerset, and Lady CLARE FEILDING, daughter of the Earl and Countess of Denbigh.

The engagement is announced between Lieut. HAROLD E. SHEPPERD, R.A.F., only son of Mr. and Mrs. E. A. E. Shepperd, of Knockholt, Kent, and OLIVE ETHEL, third daughter of Mr. and Mrs. E. H. GODSON, of Heckington, Lincs.

The engagement is announced between Capt. WILLIAM. McIVER WATT, M.B.E., the Black Watch, attached R.A.F., only son of Mr. Nat Watt, Commercial Bank House, Musselburgh, and GWENDOLEN JOYCE, younger daughter of Mr. and Mrs. J. A. CHRISTIE, Wellington, Charlton Kings, Cheltenham,

## Items

The will of Sergt. JAMES EDWARD SUTCLIFFE, R.A.F., of Southport, has been proved at £1,137.

## The Thanks of the Nation

IN the House of Commons, on August 6, the Prime Minister moved the votes of thanks to the Forces—the third one reading:—

"That the thanks of this House be accorded to the officers, non-commissioned officers and men of the Air Force for their brilliant daring and conspicuous services over sea and land."

In the course of his brief speech, Mr. Lloyd George said that everywhere on land, on sea, and in the air the strain on the heart, the nerve, the will, the courage of men had been beyond anything ever described in the story of this world. He was not going to particularise branches of the service nor to attempt to summarise their achievement. They were too well known. They were written deep on the hearts of the people of this country.

The resolution was passed *nemine contradicente*.

The House then went into Committee of Supply to consider the grants to officers. In the course of his speech, Mr. Lloyd George said: "As for Air Vice-Marshal Trenchard, he, by his energy and daring and drive and imagination and magnetism, which make for great leadership in war, made the Air Force become the powerful and formidable fighting machine that it was."

In the debate Mr. Johnson-Hicks said there was another name he should like to see mentioned in the list, that of Sir Frederick Sykes. Maj.-Gen. Seely knew the very great services which General Sykes rendered when General Trenchard resigned his post and Gen. Sykes was appointed to take command.

The grants were approved by 272 votes to 54.

## Honour for Sir H. M. Trenchard

It was announced in a supplement to the *London Gazette*, of August 8, that Air Vice-Marshal Sir Hugh M. Trenchard,

K.C.B., D.S.O., Chief of the Air Staff, had been appointed Col. of the Royal Scots Fusiliers, to date July 12.

## Mr. Joynson-Hicks Honoured

IN the deferred Prime Minister's list of Birthday Honours, published on August 13, appears the name of Mr. William Joynson-Hicks, M.P., upon whom a Baronetcy is conferred for raising the 17th and 23rd Service Battalions, Middlesex Regiment, and for public services.

## Honours

It was announced on August 8 that His Majesty the King has made the following appointment to the Royal Victorian Order:—

*Fifth Class*.—Flight-Lieut. W. A. Coryton, R.A.F.

It was announced in a supplement to the *London Gazette* on August 11 that the King has been pleased to give directions for the following appointments in recognition of services during the War:—

*O.B.E. (Military Division).*

Lieut. J. R. P. Clarke, R.N.V.R.—For valuable services in the Anti-Aircraft Corps.

Comdr. G. Grenville-Grey, R.N.V.R.—For valuable services in the Anti-Aircraft Corps.

Lieut.-Comdr. I. D. C. Howden, R.N.V.R.—For valuable services in the Anti-Aircraft Corps.

Lieut.-Comdr. G. C. White, R.N.V.R.—For valuable services in the Anti-Aircraft Corps.

*M.B.E. (Military Division).*

Actg. Gnr. E. D. Lamb, R.N.—For valuable services in the Anti-Aircraft Corps.

Actg. Gnr. (T.) P. W. Snell, R.N.—For valuable services in the Anti-Aircraft Corps.



# MAINTAINING CONSTANT PRESSURE BEFORE THE CARBURETTORS OF AERO ENGINES REGARDLESS OF THE ALTITUDE

By **LESLIE V. SPENCER, M.E.** (formerly Editor of Technical Publications, Experimental Department, Aeroplane Engineering Division, Bureau of Aircraft Production at the McCook Field, Dayton)

In the development of engines for aviation service, an entirely new problem, with which the designer of motors for ground-level operation has no concern, is encountered. That is, the aero engine has to contend with a constantly decreasing atmospheric pressure as the altitude increases. This means that unless some method of compensating for the pressure drop is provided, the engine will deliver a decreasing amount of power as it ascends. For instance, at 15,000 ft. an engine can deliver only about 60 per cent. of the power which it is capable of developing at the ground (practically sea level).

The altitude-pressure chart shown in Fig. 1, brings this out. It will be seen that at 20,000 ft. an engine must operate with an intake pressure of approximately half that at ground level. This means that the power of the engine will suffer accordingly.

In order to overcome this difficulty in the operation of engines at high altitudes, engineers have turned to the idea of super-compressing the air sent to the carburettor or carburettors so as to maintain as nearly as possible the ground-level pressure regardless of the height. This scheme of constant intake pressure maintenance has been given various names, and perhaps the best of these is the term *supercharging*. Therefore, a supercharging device or supercharger may be regarded as a machine which serves to increase the power of an internal combustion aviation engine above that which this engine would normally have at any specific atmospheric pressure. In other words, its function is not to *increase* the normal ground-level power of the engine, but to maintain as nearly as possible that power up to the limiting altitude for which the supercharger is designed. It must supply the deficiency between the atmospheric conditions encountered at any particular altitude and those necessary for maintenance of the normal ground-level power. The super-compressor must supply only enough additional air, which, when added to that obtainable at a given height, will total the amount available at the ground. Accomplishing this, the engine is able to deliver approximately the same power irrespective of its height above the earth, within limits, since for all practical purposes it may be regarded as being ignorant of the fact that it is operating in an atmosphere rarer than that at the ground.

Undoubtedly, had the War lasted longer, we would eventually have had fighting planes operating with superchargers, but up to the time of the signing of the Armistice none of the development work either in this country or abroad had progressed to such an extent that it was ready for practical application. Reports have been received from time to time that the Germans were operating planes on the Western Front equipped with supercharging devices, but there has been no corroboration of such rumours. It is certain, however, that the enemy recognised the supercharger as a potent factor in the design of fighting planes, realising that such equipment would add greatly to the performance qualities of the ships. Little is known as yet as to the exact lines along which the German development has been carried.

In Europe, serious attention, as early as 1915, was given to the development of means for maintaining constant atmospheric pressure at altitudes, but in this country, along with the rest of our aeroplane development, nothing was done by the Government in this connection until after our entrance into the struggle. The British, French and Italians each carried on independent experimental development work, and it is a striking endorsement of the turbo-supercharging scheme, as first worked out by Prof. Rateau in France, that at the present time this method of super-compression is most in favour with all experimenters after other systems have been given exhaustive trials. This applies to European development work, which was begun two years before our own. *Work in America has practically all been with the Rateau system, modified mechanically, it is true, but still preserving the same principles of operation as first advanced and tried by Rateau.* Full details of this method of supercharging will be taken up in detail later. Suffice it to say here that the Rateau system, so far, at least, appears to have the most advantages.

From the foregoing it will be apparent that the problem of keeping a constant pressure before the carburettors is an extremely difficult one. Development work, however, has progressed far enough to make it certain that there are distinct advantages to the idea, and in Europe experimentation has been carried beyond the strictly laboratory stage, a number of planes both in France and England having been flown experimentally with superchargers operating on the engines. Experimental work in America, while never brought to the point of applying the devices to planes in actual flight, has been carried forward to the extent that one of the devices developed during the War has been tested with gratifying results at the summit of Pike's Peak, which has an altitude of some 14,000 ft. All altitude tests that have been made have borne out the theories involved, and have shown conclusively that all that hinders the practical application of the machines to planes is mechanical difficulties, which are rapidly being overcome as the experimental work progresses.

Although other methods of maintaining constant inlet pressure are possible, all the systems of supercharging which have been experimented with so far depend upon the general scheme of connecting the air intake of the carburettor with the air outlet from a compressor, which is driven by one of several methods. The degree of compression of the air sent to the carburettor intake is governed by the speed of the compressor which is in turn either automatically controlled to supply the right amount of air for any given altitude, or is governed by some mechanical means.

Three types of compressors could be used for the purpose. These are the reciprocating, the centrifugal and the rotary designs. In order to make use of a reciprocating compressor, its volumetric displacement in a given time must be in excess, since it would require larger diameter cylinders than the engine, which of necessity would mean that the compressor would be as large if not larger than the engine itself.

The rotary compressor or blower has been tried under all conditions in competition with the centrifugal type of compressor by the British at the Royal Aircraft Establishment, and has been discarded in favour of the latter. Although light and of small bulk, the rotary blower does not appear to be capable of extending operations at high speed, due to mechanical limitations. Its capacity is also not so great for a given speed as that of the centrifugal type, in the small sizes such as required for such service.

In general, the centrifugal form of compressor unit has proven the most desirable when all considerations are weighed. Having a minimum of working parts, being very compact for a given capacity, and being capable of operation satisfactorily at top speed over long periods of time due to its simplicity of construction, the centrifugal compressor would seem to warrant exclusive attention on competition with the other two possible types. As a matter of fact, experimenters with compressors for this service have all come to this conclusion, and only the centrifugal type is now thought of when laying out a system for super-compression.

As to the methods of driving the compressor, there are also three possibilities. It can be direct-connected through the engine just as a magneto or other accessory is operated. The gear train with the crankshaft or other driving shaft of the engine must, of course, be so designed as to produce the proper relative rotative speed of engine and compressor, so as to give the rotor the requisite speed for the purpose in hand. As a second consideration, the compressor might be driven by a small steam turbine, the steam being produced by suitable utilisation of the heat of the exhaust gases from the engine. A third alternative is to drive the compressor impeller by means of an exhaust gas turbine, receiving its energy directly from the engine exhaust gas.

*Taking these up in the order named, much experimental work has been carried on with the direct-connected means of drive through an intermediate gear train. England and Italy have done a great deal of experimenting with the gear drive, and have experienced great difficulty in coping with the severe stresses developed in the rapidly operating mechanism due to sudden fluctuations in the speed of the*



engine. In order to relieve the mechanism of any ill effects of sudden changes, some form of clutch or a series of clutches can be in-built into the drive to absorb them. But this means added complication that is not altogether desirable. Consequently, those who at first favoured gear drives are gradually leaning towards the turbine drive.

Turning to a consideration of the steam turbine, this need not be given very serious attention, in that its use would involve the installation of a boiler, condenser and other complicated apparatus necessary to steam generation. Such a system of turbine propulsion has never been tried, but it is entirely possible to utilise the heat of the exhaust gases to produce the steam. Although such an arrangement could undoubtedly be built to operate satisfactorily in the laboratory, it has no practical value for application to an aeroplane, where every added complication is serious, and where every added ounce of weight is important. Aside from these considerations, a steam generating set would be exceedingly hard to incorporate within the narrow confines of the engine part of the fuselage.

We, therefore, arrive at the conclusion that the turbine driven by the energy of the exhaust gases offers the best possibilities from every standpoint, and that this conclusion is correct is evidenced by the fact that although England primarily designed its supercharger systems for direct-connection of the compressor to the engine through gearing, this idea has practically been abandoned at the Royal Aircraft Establishment in favour of the exhaust-gas turbine-driven centrifugal compressor. This is the Rateau system, with which the efforts of the French engineers have been almost entirely concerned.

The exhaust-gas turbine can be connected direct with the exhaust ports of the engine through special manifolding replacing the standard manifolds, so that all the exhaust must pass through the turbine nozzles and give up its energy to the turbine rotor before being allowed to escape into the atmosphere through the turbine discharge passage. In the designs which have been experimented with thus far, the turbine rotor and the impeller of the centrifugal compressor are mounted on the same shaft. Thus the building of the turbine and compressor as a unit is made possible, resulting in an exceedingly compact machine, which in most instances can be mounted directly on the front of the engine. By this arrangement, the outfit takes up a minimum of space, and although such a position of the device makes it necessary to remove the radiator from the front of the fuselage, this offers no difficulties, since a great many designs of planes place the radiator in the wings or at the sides, or at the bottom of the fuselage from choice.

It will be seen that inasmuch as there is no direct mechanical connection between the turbo-compressor and the engine, this type of apparatus is entirely free from troubles due to sudden variations in the rotative speed of the engine, which is one of the principal objections to the gear-driven compressor installation.

In conducting the engine exhaust gases to the nozzle-box of an exhaust gas turbine, and thence through nozzle ports to the turbine wheel, no difficulties are encountered except that the high temperatures of the exhaust gases must be coped with. To date, this has been the main trouble designers of turbo-superchargers have had, viz., designing the device in such a way that the excessive heat can be cared for without damage to the turbine parts. This trouble seems to be close to satisfactory solution, and it is not looked upon as being serious enough to overbalance the other advantages of the exhaust turbine-driven supercharger as compared with other types.

Of course, around the turbine rotor there is atmospheric pressure, whatever its value may be at any given altitude, and as the supercharged engine exhausts at a normal pressure of about 30 ins. of mercury, corresponding to a normal atmospheric pressure of about 15 lbs. per sq. in. at sea-level, the expansion of the gases from this pressure to that of the atmosphere at any given altitude is sufficient to operate the turbine at high speed. Ordinarily, the turbine rotor speeds run up to 25,000 r.p.m. in these devices, due to this expansion. There is plenty to take care of the needs of the device, as will be evident.

The rotating member of the compressor being on the same shaft as the turbine rotor, it is designed to draw in the rarefied atmosphere and compress it to normal ground-level value—also approximately 15 lbs. per sq. in. The compressed air is sent direct to the carburettor or carburettors through the intake piping system.

Thus it will be seen that the engine gets its charge at sea-level pressure and discharges at this pressure, and although this condition is artificially maintained regardless of the

height (up to the limits of altitude for which the turbo-compressor is designed), the engine may be considered as being always operating in ignorance of the fact that it is not on the ground at or near sea level.

From this it will be seen that in order to maintain efficient operation, the induction piping system of the apparatus must be proof against air leakage. That is, there must be no chance for pressure escape between the carburettor air-intake connections and the induction piping running from the air compressor. Similarly, the junction between this induction piping and the compressor casing proper must be air-tight. While maintaining air-tight connections of this kind offers some difficulties under service conditions, this is not considered a very difficult matter, since special types of gaskets and connections have been and are being devised to take care of this point efficiently.

Experiments with this system indicate that of the energy of combustion the engine and turbo-compressor utilise about 33 per cent., whereas approximately 45 per cent. is lost in the exhaust which finally escapes from the discharge ports of the turbine. The balance of the combustion energy is given up to the cooling water and is dissipated in other mechanical losses throughout the cycle.

When the United States entered the War, as has already been pointed out, the Allied countries had already done two or three years' experimental work on various types of supercharging systems. Soon after our entry into the struggle, Mr. E. H. Sherbondy and Dr. Sanford A. Moss were requested by the Government to take up the investigation and research and development work on supercharging for our own Air Service. Mr. Sherbondy brought to the work long experience in the design of internal combustion engines and in power-plant and turbine construction. Likewise, Dr. Moss, engineer for the General Electric Co., Lynn, Mass., has had a great deal of experience with exhaust turbines, carrying on such experimental work for his concern over a long period.

Both of these engineers worked primarily with the Rateau system, as already described, and although the same cycle of operations was followed in each case as Rateau originated, their work is mechanically very little like that of Rateau. Dr. Moss and Mr. Sherbondy carried on their experimental work also entirely independently of one another, evolving units which have no mechanical similarity whatever. It was only after careful study of the various types of compressors, drives, etc., that they arrived at the centrifugal compressor exhaust-turbine system as presenting the greatest possibilities.

The designs of the machines and the results of the tests of the Moss and Sherbondy devices offer an interesting series of experimental and engineering records, and although up to the time of the signing of the Armistice, the machines had not been developed to the stage where they were ready for flight testing, the various difficulties incident to any new development work were so far toward practical solution that if the War impetus had been maintained, it is probable that we should have seen American supercharging systems in the air this spring or summer.

As mentioned in the previous general discussion of the problem of supercharging the aero engine so as to maintain a practically constant induction pressure regardless of the altitude, and therefore nearly uniform power output, the United States Government soon after our entry into the War secured the services of Mr. E. H. Sherbondy and Dr. Sanford A. Moss to carry on independent investigations along this line, and to design super-compression machines which would be especially adapted to the Liberty twelve-cylinder engine.

It is doubtful if this line of experimental work would have been inaugurated so early in our aircraft experimental programme if it had not been for the fact that the promising results which Prof. Rateau and other European experimenters had secured during the two or three years previous had not been followed closely by the U.S.A. National Advisory Committee for Aeronautics and by the Government engineers.

Having at hand the results of previous experimentation abroad, neither Sherbondy nor Moss had to strike out blindly, but in the main concentrated upon ways and means of developing thoroughly practical machines or systems based primarily on the scheme of supercharging originated by Prof. Rateau, that is, a system in which the power for driving the compressor is furnished by an exhaust-gas-driven turbine. Moss clung strictly to the one line of action, whereas Sherbondy studied the problem also from the angle of driving the compressor by a shaft from the engine through the intermediary of a set of gears which served to step up the speed to that required for the operation of the compressor impeller. Thus, he not only designed several supercharging apparatus utilising the Rateau principle, but he also laid out

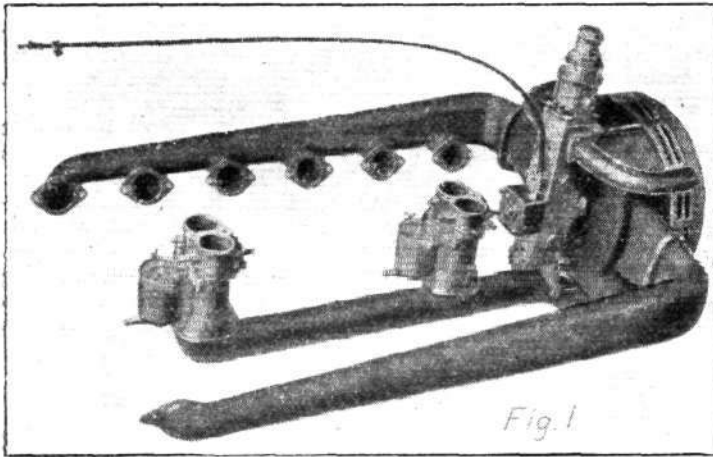


Fig. 1

geared designs. Only the former were built, however, as Sherbondy soon became convinced that the utilisation of the exhaust gas energy for driving the impeller was to be preferred, for reasons which have already been pointed out.

Although neither Sherbondy's nor Moss's machine was ready for actual flight tests at the time the Armistice surprised the world, the work had so far progressed that it remained only to alter certain of the mechanical details so as to overcome weaknesses which the extensive ground tests had brought to light, when either machine would undoubtedly have been ready for preliminary trial in the air. This is particularly true of the Moss supercharger, which has been subjected to gratifying altitude tests on a portable dynamometer at the summit of Pike's Peak—a little over 4,000 ft. above sea level.

If the work of European experimenters had not already convinced the aeroplane engineering world that there is great advantage to be gained by maintaining a constant pressure before the carburettor regardless of the altitude—

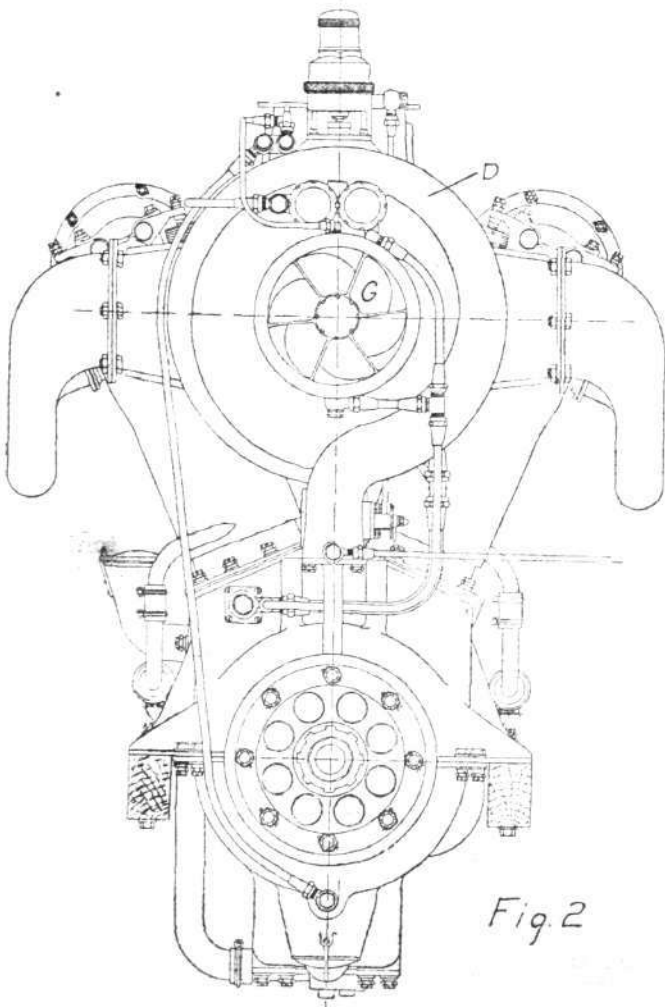


Fig. 2

within limits, of course—these altitude tests of the Moss device would have proved it. The advantages being already fully appreciated, due to the earlier tests in England, France and Italy, the results obtained with the Moss apparatus served to further strengthen the validity of the theories back of the idea.

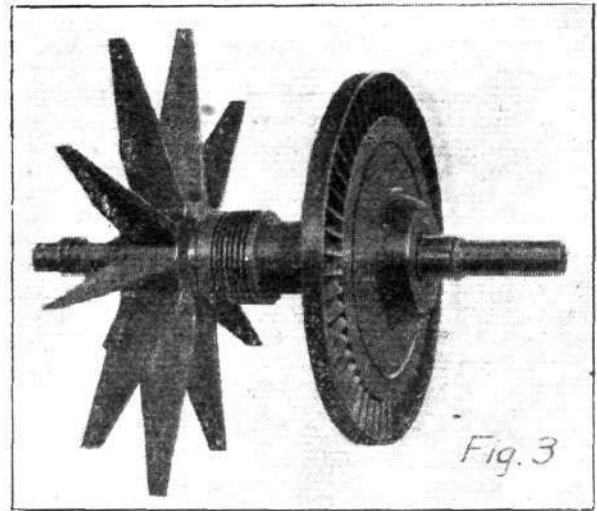


Fig. 3

#### The Sherbondy Superchargers

Fig. 1 gives a very clear idea of the general arrangement of the apparatus of the Sherbondy turbo-compressors as laid out for the Liberty twelve-cylinder engine. The two carburetors are carried on the one induction pipe, which has air-tight joints to the carburettor air intakes, and also to

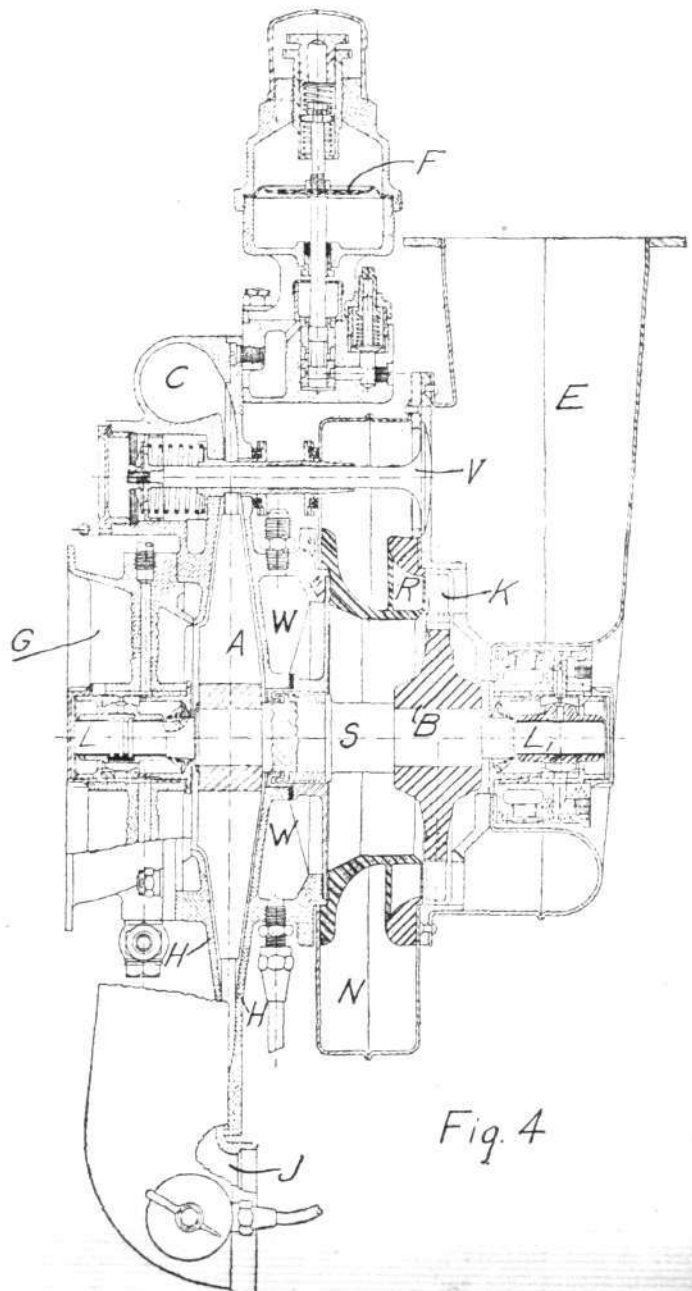


Fig. 4

the compressor discharge. The specially-designed exhaust manifolds which lead the exhaust gases to the turbine are also illustrated clearly. The compactness of the turbine and compressor unit proper is seen, this main part being designed to attach to the front of the engine without interfering with the normal position of the propeller. Installation



of the turbo-compressor here means that the radiator must be put elsewhere than at the front, most probably in the wings.

At the rear of the turbine housing is the automatic control mechanism, which serves to maintain the turbine speed at the right value to supply the correct supercharge under any atmospheric conditions up to the limit of about 20,000 ft., which is the maximum height for which the Sherbondy machine is intended to be effective.

As already explained, the turbine rotor and the air impeller are direct-connected on the same shaft, a labyrinth arrangement being constructed on the shaft between the two rotating members to prevent pressure leakage between the compressor chamber and the turbine. The rotating part of the device is shown in Fig. 3.

Fig. 4 is a sectional drawing of Mr. Sherbondy's last supercharger, in which a number of minor changes were made over the two previous designs in order principally to overcome the troubles due to the warping of the thin-gauge parts of the two earlier constructions. The impeller, A, is enclosed in an aluminium housing, H, which, throughout the length of the impeller blades follows the same taper, and is carefully machined inside to maintain a constant clearance between blades and housing of only twenty-five thousandths of an inch. The housing has the same taper as the blades, but to a diameter a little larger than that of the impeller, where its sides become parallel for about another inch. This space acts as a diffusion chamber, after which the housing opens into an outer chamber, C, of circular section. This outer chamber is of constantly increasing diameter, tapering from an area of almost nothing until it finally reaches the area of the induction pipe. This may, perhaps, be better understood by referring to the front elevation drawing in Fig. 2, which shows the outer chamber, D, very clearly. The point of juncture with the induction pipe is shown at J in Fig. 4.

The impeller has ten blades, and is 9 ins. in diameter. The blades are tapered from a point a little over half-way out on the intake side, and converge to a relatively narrow tip width, as seen in the drawing. The entering edge of the blades is rounded off to prevent air shocks.

A most interesting feature is the turbine rotor, which in the latest Sherbondy design is fitted with 72 buckets cut by a special process to the greatest accuracy. As will be readily appreciated, the buckets all had to be of exactly the same weight so as to prevent unbalance of the rotor—a condition which would be very serious at the high speeds which the device is designed to attain. These buckets are assembled into sockets accurately machined in the periphery of the rotor proper, and expansion under the heat of operation serves to hold them in place most securely.

Much research and experimentation was carried out by Mr. Sherbondy before he was able to fix upon an alloy which would be sufficiently strong and of a high enough heat-resistant quality to withstand the very high temperatures and stresses encountered in operation of the device.

The turbine rotor was designed for an angular velocity of 780 ft. per second, which means a rotative speed of 31,050 r.p.m. The turbine nozzle angle is  $21^{\circ} 45'$ , and that of the buckets,  $35^{\circ} 15'$ , with a gas velocity at entrance designed to be about 1,950 ft. per second, and that at exit from the buckets, 750 ft. per second. This is a ratio of a little over 2.5 to 1.

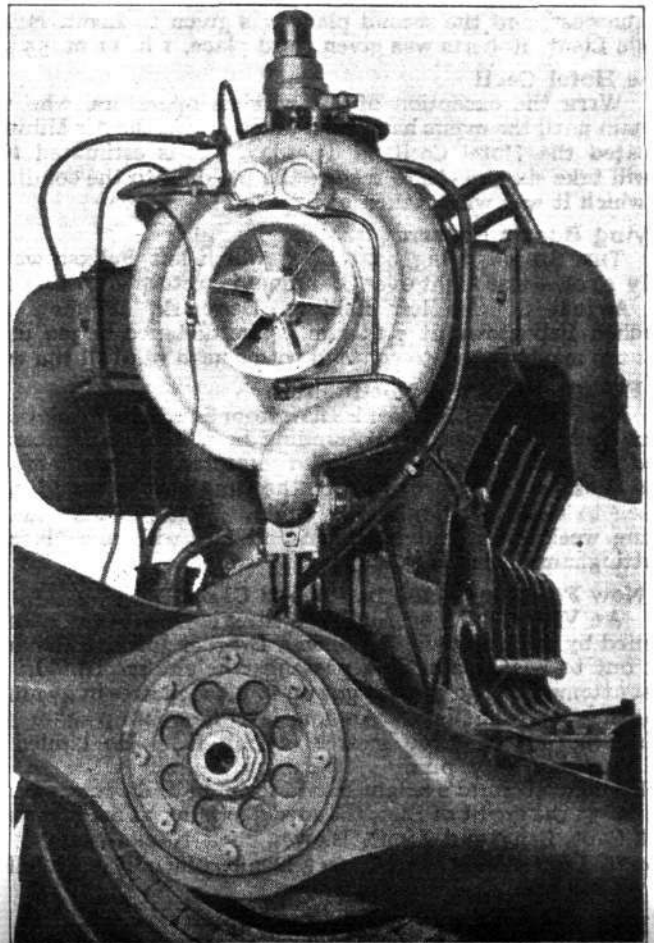
In designing the air inlet, it was desired to prevent all air shock so far as possible, and, therefore, the conical air inlet, G, Figs. 2 and 4, was provided with radial guide vanes which impart a certain velocity to the air and give it direction also before it comes in contact with the rapidly-rotating impeller blades.

The designing of the bearings was also a tough problem, for they must withstand a variety of severe conditions in service, especially when the device is operating at or near its maximum effective speed. Reference to L and L<sub>1</sub> in Fig. 4 will give an idea of the details of their construction. The rear bearing, L<sub>1</sub>, is subjected to most serious conditions in this design, in that it is in the path of the exhaust gases, whereas the front bearing, L, is in the centre of the air inlet part, and is under no severe heat conditions. Both bearings are constructed with spherical seats, which allow them to compensate automatically for any misalignment of the assembly, a possibility should the castings warp to any extent under the high temperatures. They are in effect small self-aligning bearings. The bearing proper between shaft and housing is of plain babbitt. At the front there is, in addition to the bearing just mentioned, a marine type thrust bearing which holds the rotating member against end-thrust caused by the pressure of the gauges going through the nozzles against the buckets of the rotor.

Pressure feed is used for efficient lubrication of both bearings, which are provided with an excess over actual requirements for obvious reasons. This oil is intended to be forced to these bearings through connection into the regular pressure feed line of the Liberty engine. Thus the Liberty oil pump supplies them, avoiding an added complication of having a special oil pump in the turbo-compressor unit itself. An oil seal is made against oil leakage around the shaft by providing a washer that is a loose fit on the shaft, and which has a spherical shape on one side. This side fits against a seat in the bearing chamber, against which it is held by a spring. This construction is very effective in preventing oil escapeage into the turbine casing or blower housing, as the case may be.

In several of the earlier Sherbondy designs, trouble was experienced with the gas casing, which had a tendency to warp and thus throw the turbine nozzles out of place to such an extent that they touched the turbine wheel in several instances. Other troubles were encountered due to warping of the nozzle ring and the misshaping of the nozzles themselves. In the last design, as seen in Fig. 4, however, these difficulties were overcome in large measure by bolting the nozzle ring to the compressor casing and permitting the gas casing to deflect as much as it pleased with no ill effect upon the running of the device. It is just such problems as these that Sherbondy has had to overcome throughout, for the intense heats encountered, the restricted space available for the unit and the necessity for extreme lightness are three diametrically opposed factors which must be compromised into the best possible assembly.

At F in Fig. 4 is seen the diaphragm, which is the controlling unit for operation automatically of the by-pass valves, V, which allow escape of exhaust in proportion to the supercharger speed required for efficient working of the turbo-compressor at any given altitude. Obviously, at ground level, these by-passes are open, whereas, at the maximum height, they should be entirely closed so that all exhaust energy is given to the turbine to operate it at top speed. In effect, the automatic control works upon the principle of differential pressure on the two sides of the diaphragm, which opens and closes a piston valve in the casting. This, in turn, operates a system of oil ports through which oil flows under pressure to open or close ports that govern the action of the small pistons of the by-pass valves. The



The supercharger developed by E. H. Sherbondy for the Aircraft Production Bureau



action is thus devoid of shocks, and any movement of the by-passes is gradual and lacking in jerkiness that would tend to produce undesirable shocks to the mechanism as a whole. In other words, the control system has been arranged to have a more or less damping action, making any changes in the amount of gases passing to the turbine gradual rather than sudden enough to cause trouble.

In operation of the supercharges the air is drawn in through the passage, G, is carried around by the impeller, A, and in its compressed state is sent to the carburettors through the outlet, J. The exhaust gases are led to the gas-chamber, N, whence they are directed through the nozzles, R, to the buckets, K, of the turbine wheel, B. The exhaust gases, after giving up their energy, are discharged through the exhaust outlet, E, into which the valves, V, also send any gases which are not sent through the turbine, due to the automatic control already mentioned. There is in reality no connection between the turbine and the compressor, except through the common shaft, S, which is fitted with a

labyrinth between the two rotors to prevent pressure escape from the turbine to the blower casting. As a means of cooling, water is circulated through the space, W, between the two parts, a provision which was quite essential to assist in keeping down the excessive temperature.

The Sherbondy machine was designed to have an air discharge capacity of 692 cub. ft. per minute when the Liberty engine is operating at 1,700 r.p.m. Under these conditions, it is intended to handle any pressure requirements of the engine from nothing at sea level to approximately 7.5 lbs. per sq. in. at 20,000 ft., at which altitude the atmospheric pressure is about half that at sea level.

It is computed that the theoretical horse-power available in the exhaust gas of the Liberty engine is about 80, whereas, with a compressor efficiency of around 60 per cent. the horse-power required to compress the air is about 32, indicating that the overall efficiency of the system is somewhere in the neighbourhood of 40 per cent.

(To be concluded.)

### An Irish Aerial Derby

In connection with the Royal Air Force sports at Lansdowne Road, Dublin, an aerial Derby was held on August 8 over a course from Tallaght, Co. Dublin, to the Curragh, then to Gormanstown, Co. Meath; from there to Dublin, and from Dublin to Tallaght, a distance of 102½ miles. The machines were handicapped on the Air Ministry's ratings of speed.

Twenty-one machines took part, including Maj. C. J. Mackey, M.C., D.F.C. (R.E. 8), Lieut. T. H. Langrishe (Clerget Avro), Lieut. F. A. Urmiston (Mono Avro), Capt. F. Workman, M.C. (Clerget Avro), Lieut. W. A. Roberts (Clerget Avro), Lieut. W. E. Davies (Clerget Avro), Capt. F. C. Mailer, A.F.C. (D.H. 9), Lieut. J. S. Chick, M.C. (D.H. 9), Capt. M'Keon (S.E. 5), Capt. R. B. Boume (D.H. 9), Lieut. Rodwill, R.I. (D. H. 9), Capt. Bowen (D.H. 9), Lieut. T. H. Wright (Clerget Avro), Capt. Seagrave (Mono Avro), Lieut. P. D. Baker (Mono Avro), Major Baker (Bristol), Lieut. Woodman (Bristol), Lieut. Holland (Bristol), Captain Sibley (Mono Avro), Capt. Gerard (Camel), Lieut. Mansfield (Bristol).

The result was as follows:—Lieut. Urmiston, 1 h. 9 m. 34 s.; Capt. Sibley, 1 h. 9 m. 35 s.; and Lieut. Baker, 1 h. 11 m. 55 s. Capt. Sibley was disqualified for finishing on the wrong side of the post, and the second place was given to Lieut. Baker, while Lieut. Roberts was given third place, 1 h. 11 m. 55 s.

### The Hotel Cecil

WITH the exception of the wireless operators, who will remain until the masts have been taken down, the Air Ministry vacated the Hotel Cecil on Tuesday. It is estimated that it will take six months to restore the building to the condition in which it was when taken over.

### Flying Boat's Return

THE British flying boat F. 5, which left Felixstowe on July 19 on a test flight over Scandinavia, returned to England on August 6. She left Esbjerg, Denmark, at noon and reached Felixstowe at 7.15 a.m. The distance is 300 miles but the machine had to contend with a head wind all the way.

### A Flying Week for Nottingham

ON Friday Maj. McMinnies flew from Southport to Nottingham to see Sir Jesse Boot, landing in a small field next to Boots's recreation ground. He transacted his business and was back in Southport again in the time that it would have taken to reach Nottingham by train. It is probable that a flying week and aerial gymkana and fête will take place at Nottingham during September.

### A New Passenger Height Record Claim

AT Villacoublay on August 8 Maurice Walbaum, accompanied by his mechanic, Tisse, on a Breguet 300 h.p. Renault, set out to beat the world's passenger height record. In his first attempt at 5.30 p.m. he got up to 6,000 metres in 27 mins., and then landed at Issy. An hour later he went up again, and this time got to 7,800 metres (25,740 ft.). He landed at Villacoublay at 7 p.m.

The official world's height record for pilot and one passenger stands to the credit of Bier, the Austrian pilot, at 6,170 metres, but Capt. Lang and Lieut. Blowes, on a Napier-engined De H.9, in January last went up to a height, officially certified to be 28,000 ft.

### Flying Through the Arc de Triomphe

IN defiance of an official interdict a Frenchman, Charles Godefroi, has succeeded in flying through the Arc de Triomphe, the feat which even the French have been moved to term *une prouesse folle*, and in practising for which Navarre lost his

life. The flight was made soon after 7 a.m., on a Nieuport, of 9 metres span, fitted with a 120 h.p. Le Rhone motor. The height of the opening in the Arc de Triomphe is 29.42 metres and the width between the pillars 14.62 metres. Godefroi flew up the Avenue de la Grand Armee through the Arch to the Concorde where he managed to get above the trees and turned back to Villacoublay.

The authorities have been much perturbed by the flight and have prohibited the exhibition of a film showing it. They also endeavoured to suppress all illustrations but found this impossible. The Army authorities, it is understood, are holding an inquiry to discover how Godefroi, who was a sergeant in the Air Service until his demobilisation last week, secured possession of a military machine.

### A Motorless Flyer

DURING the War the competition for the Peugeot prize of £400 for a flight of 10 metres carried out with no other motive power than that furnished by the pilot, has been in abeyance. Recently, however, interest in it has revived, and there has been a lot of strenuous practising lately. A message from Paris on August 11 announced that the well-known French cyclist, Poulain, at Longchamps, had made a hop of 12 metres at a height of 1 metre, his speed being 9 km. per hour.

### Smuggling Saxon Crown Jewels

IT is reported from Malmo that an attempt was made on August 9 to bring valuables belonging to the ex-King of Saxony into Sweden, states the *Times* correspondent at Copenhagen.

At 9 a.m. a seaplane approached the coast at Smygehuk, the southernmost point of Sweden, and a German couple, who for some time had been living in the neighbourhood, had come down to the shore. After an exchange of signals the airman dropped two parcels, and then returned.

The coastguard, seeing the incident, and thinking that smuggling was being attempted, tried to catch the Germans, who, however, succeeded in escaping. Meanwhile the Stockholm police had been informed by telephone, and later in the day the Germans were arrested at the neighbouring railway station. They first maintained that the parcels had fallen into the sea, but these were duly found when the Germans were searched.

The parcels contained some exquisite lace, jewellery and Government securities amounting to large sums, belonging to the ex-King of Saxony. The valuables have been retained by the authorities.

According to a later message, the woman is a countess and the man a Dresden court official.

### Aeroplane Disaster in Germany

ACCORDING to messages from Berlin a giant flying machine hired by the Ukrainian Government was shot down by Polish troops in the Forest of Routen, and the 10 people on board, including M. Vitovsky, formerly the West Ukrainian Minister of War, were killed.

The pilot was Bendereich, and the machine carried a crew of five, as well as four passengers. The machine was on its way from Breslau to the Ukraine when the catastrophe occurred.

Besides the dead bodies there were found scattered about round the spot where the machine fell several bags and quantities of Russian gold coin and currency notes.

### To Fly to Spitzbergen

A BRITISH aviator is at present at Bergen with his machine, and is about to leave by steamship for Tromso, whence he will fly to Spitzbergen, according to a message from *The Times* correspondent at Christiania.

# AIRISMS

## FROM THE FOUR WINDS

Who said the aeroplane could not beat the cable? Read!

Telegram received 11.25 a.m. on August 12:—

"Handed in at Amsterdam at 2.30 p.m., on August 9.

"Cannot get through until Tuesday, arrive Wednesday," etc.

Only three clear days!

And there were apologies last week as to an adverse wind being the cause of a seaplane taking 7½ hours to fly from Esbjerg to Felixstowe.

the Force, His Majesty may well desire to inspect this latest "creation," having regard to the possibility of his having occasionally to don it personally.

A SUGGESTION in regard to the R.A.F. Cadet College is made by "an old officer," who fears that the adoption of the plan as set forth can scarcely fail to impair very seriously the future value of the R.A.F. "It would seem obvious," writes an old officer, "that a reasonable amount of



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A corner of a batch of machines, chiefly S.E.5's, for disposal at Hendon. These are a varying quantity, the numbers being added to each day, whilst those disposed of balance more or less the new-comers.

SMALL wonder the wail has gone forth from the Government: "Bankruptcy stares Great Britain in the face."

WAKE up England!

Wake up Telegraph Authorities!!

ON Monday last Air Vice-Marshal Sir Hugh Trenchard submitted to King George for inspection a new uniform (index number not yet known) for the R.A.F. As Chief of

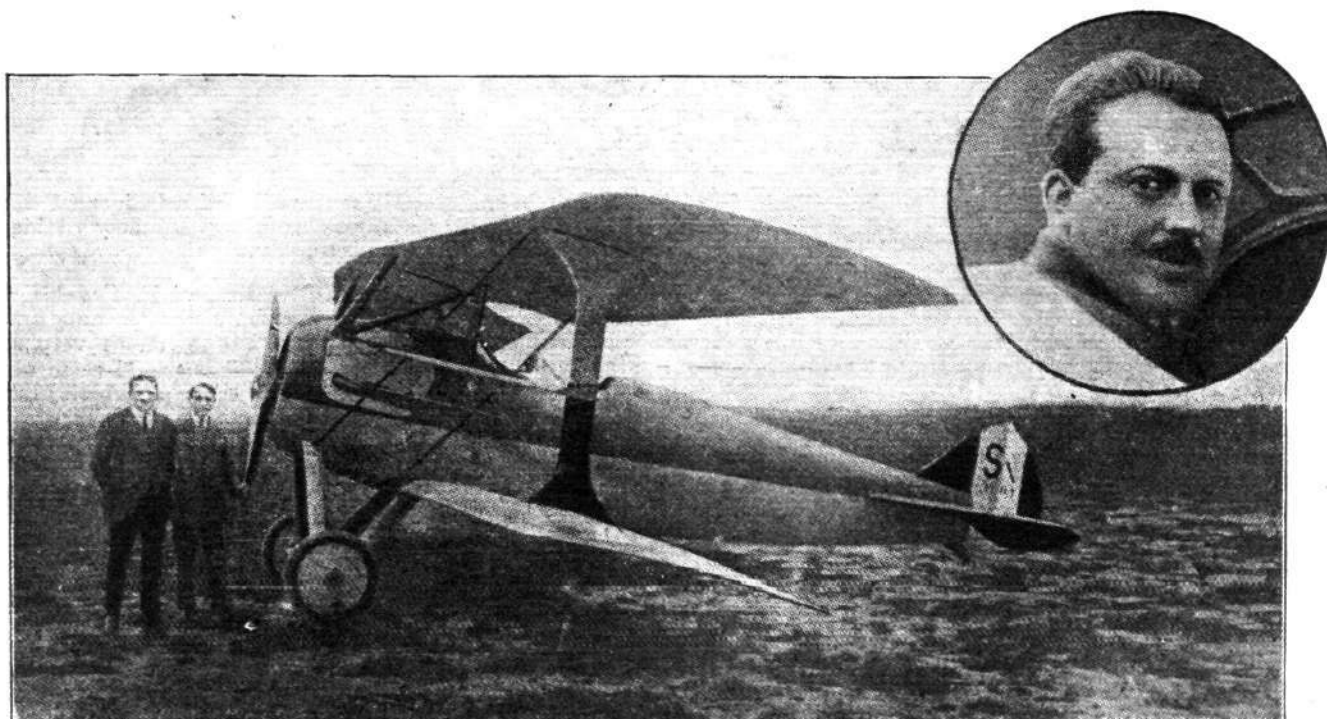
military knowledge is essential to intelligent observation from the air or otherwise, of military operations. Therefore the airman, in order to be a competent observer, must be a naval or military, not a civilian 'specialist,' and entry to the Air Force Cadet College ought consequently to be from the Navy or Army, or at all events from among the trained cadets of Dartmouth, Woolwich and Sandhurst. Information that enemy troops were seen at a certain place at a certain hour is valuable indeed, but its value will be



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What it is to be a celebrity, and a sample of what you then have to face! A bunch of the 32 photographers who awaited the appearance of Sir A. W. Brown and his bride, Miss Kennedy, after their marriage at the Chapel Royal, Savoy, on July 29.





**THE SPAD-HERBEMONT TWO-SEATER MONOCOQUE :** A Military biplane, 300 h.p. Hispano-Suiza, on which the French pilot, Sadi Lecointe, made a record altitude (solo) flight of 89,200 ft. He also beat the speed record (with passenger) with a speed of 142.8 m.p.h.

greatly increased if the scout who makes the report is capable of making, on the spot, deductions likely to assist the General Staff in divining the object with which the enemy troops have been sent to the locality wherein they have been observed. In a word, let us first make trained sailors and soldiers, and afterwards make of them airmen and other specialists. The R.A.F. cannot efficiently be the 'eyes' of the naval and military command unless its observers are capable of understanding what they see."

THAT proper military training should be beneficial to the efficiency of the force there can be no possible doubt, and it is hardly to be conceived that this will not be part of the system, but side by side, not of necessity primarily, with the bringing into line of the young mind, with matters more directly concerned with the art and science of aviation. It is the flying spirit that in the first instance matters. The rest follows naturally.

"SEVERAL thousand German prisoners," so runs a report, "paraded at Dorchester internment camp yesterday for the presentation by the R.A.F. of money and a watch to Pte. Bruckmann, a prisoner, who rescued two officers from

a burning plane. He was himself burned. The War Office has granted him immediate repatriation."

We are just wondering whether this added reward of the W.O. may not just now be a doubtful blessing.

THAT "fish by aeroplane" has, after all, materialised. But it would nevertheless have to be at least a millionaire's, or even a war profiteer's luxury to have his fish for dinner brought that way, at present, in order to save an hour. For a year or two, anyway, we fancy most of the Manchester men of wealth will continue to take their chance of getting decently fresh fish by waiting the two hours which, according to Mr. Bracegirdle, the enterprising aerial-route fishmonger, it takes for a cargo of fish to travel from Fleetwood to Manchester. But then the formality of handing every cargo of fish, a quarter of an hour after its arrival in the City of Trams, to the Lady Mayoress at the Town Hall, as in Mr. Bracegirdle's case last week, is not insisted upon by the sanitary authorities.

THIS sort of spasmodic enterprise moreover is apt to bring trouble upon and indictments of inefficiency of the aeronautic movement generally, by reason of its setting up ideals in the



Sir Sayed Ali El Mirgham, K.C.M.G., K.C.V.O., and some seven Sudanese Chiefs on a visit to Hendon, on flying experiences bent. Although Sir Sayed was forbidden to fly by the Holy Men who accompanied the Mission, by reason of it being irreligious, the eight chiefs took chances upon this point, and after a flight in a Grahame-White machine, one of the visitors picturesquely described his impressions as follows: "The earth looked like a carpet and the clouds like mountains." Another interesting point was that these ingenuous folk insisted upon being photographed, because unless they took back some proof their tribes would not believe they had been in the air.



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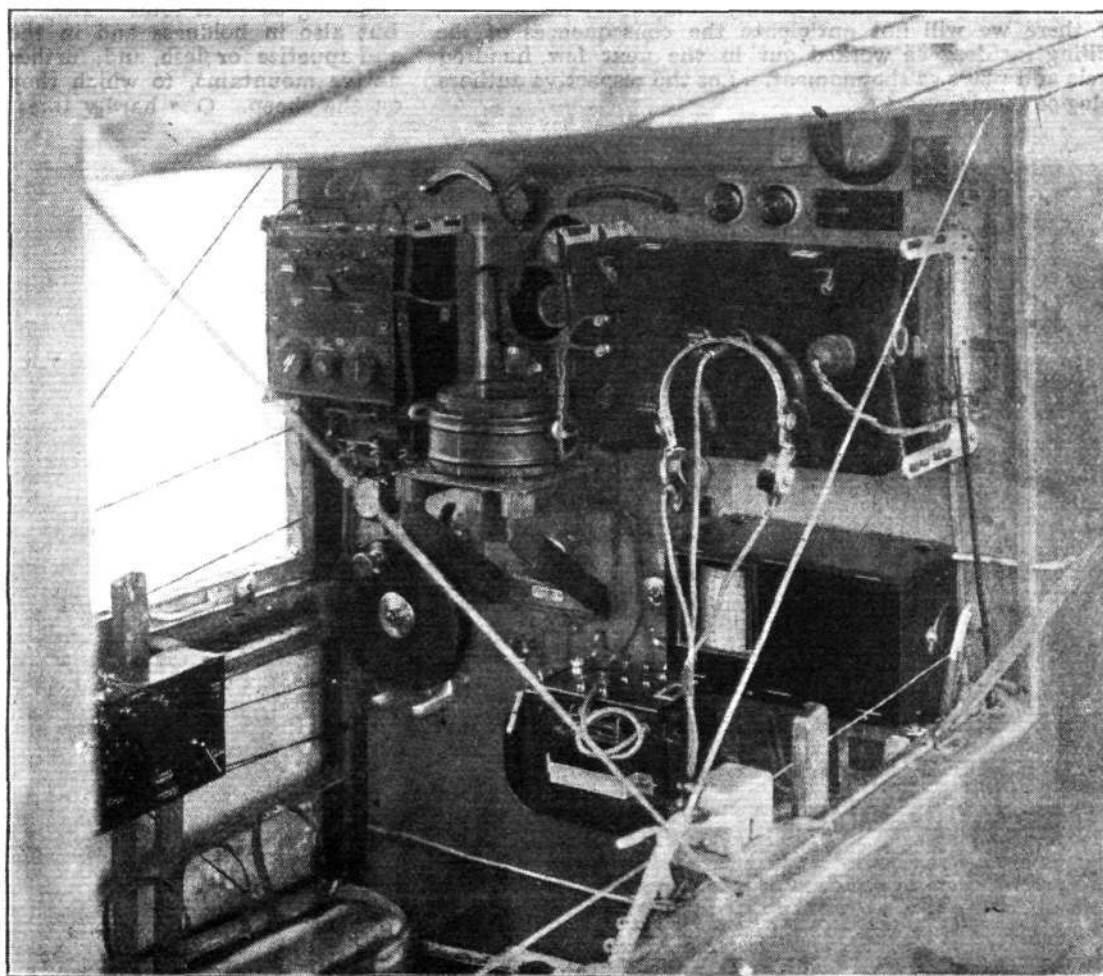
A French lady designer or one of the greatest London emporiums goes a flipping at Hendon in a D.H. enclosed machine, no doubt with designs on designs aviatric.

minds of the unpractical members of the public, which there is, for some time, not the faintest hope of realising. By way of instance, this little 12-stone Fleetwood-Manchester fish stunt instantly brings forth suggestions for distributing fish generally by way of the air.

"Why should not the aeroplane," writes one shrewd housewife from Wigmore, Herefordshire, "be used more freely for the rapid transport of fish from the sea to inland towns and villages? It would be a boon to many to taste fish in its full-flavoured freshness, and invalids especially would be grateful." Without a doubt this correspondent is right, but nothing short of a new Government Department, at the taxpayers' expense, could do credit to such an enterprise upon these lines.

MR. T.O.M. SOPWITH, as an early prophet and believer in the future success of aviation, was quite a success, most people will admit. Therefore, in these days of croaking, it is really heartening to read in the *Financial Times* "Saturday Causerie" the following interesting item, to which considerable aviatric interest attaches: "It is now understood that the purchaser of Lord Lovelace's Surrey seat, Horsley Towers, which was disposed of by auction the other day for £150,000, is Mr. "Solly" Joel, and that Mr. T.O.M. Sopwith, of the Sopwith Aviation Co., is also considerably interested in the deal. Mr. Joel has paid much more attention lately to real estate than to mines, his previous big transaction, which occurred about 18 months ago, being the acquisition of the site of Meux's Brewery in the Tottenham Court Road.

The instrument board and wireless outfit in the cabin of the "Seabird," the biplane manufactured by the Alliance Aeroplane Co., which recently flew from London to Madrid in 7½ hours





for £500,000. Mr. Sopwith, who lives close by Horsley—at Cobham—and rents the Earl of Lovelace's shooting, was credited locally with a keen desire to secure the Horsley Towers estate for the purpose of erecting an aerodrome in the park, which covers 260 acres, and he is currently believed to have offered £200,000 for the property before the public sale. If that be so the terms on which Mr. Joel has secured it would appear to be very favourable to the purchaser. The total area of the estate is 2,750 acres, with a rent roll of £2,500, excluding the Lovelace seat. The estimated value of the timber alone is put between £64,000 and £80,000. Mr. Joel has clearly not left his astuteness behind in the Kaffir Market. Horsley Towers is one of Sir Charles Barry's Tudor-Gothic mansions. It has looked on many changes, but none so strange as that which may eventually cause it to witness within its shadow the rearing of Sopwith 'pups.'

THE competition in novel air "stunts" continues, and with the vast possibilities in this direction there should be, before the novelty wears off, some really amusing, if not startling developments from the smart set of hustlers. The other day it was an actual wedding in the air; then the fish episode from Manchester; again the Arc de Triomphe foolishness and the flying, for the first hour of their honeymoon, of Mr. Weeks, a pilot, with his bride, Miss Achfield, after being married at Swansea.

Now comes, from Messrs. Brown Bros., the record of the completion of a little business deal in the air. This firm write us as follows in regard to what they claim to be the first instance in history of securing an order for motor accessories while in the air: "Mr. Arnold, who is our Australasian representative, took a trade visitor from New Zealand for an aeroplane flight, and while at an altitude of between 3,000 and 4,000 ft. over London and travelling at a speed of over 100 miles per hour, celebrated the occasion by securing his fellow passenger's signature to a substantial order for motor accessories. This is an actual fact, as the writer has inspected the order, and whilst the caligraphy is somewhat shaky, it certainly was quite legible."

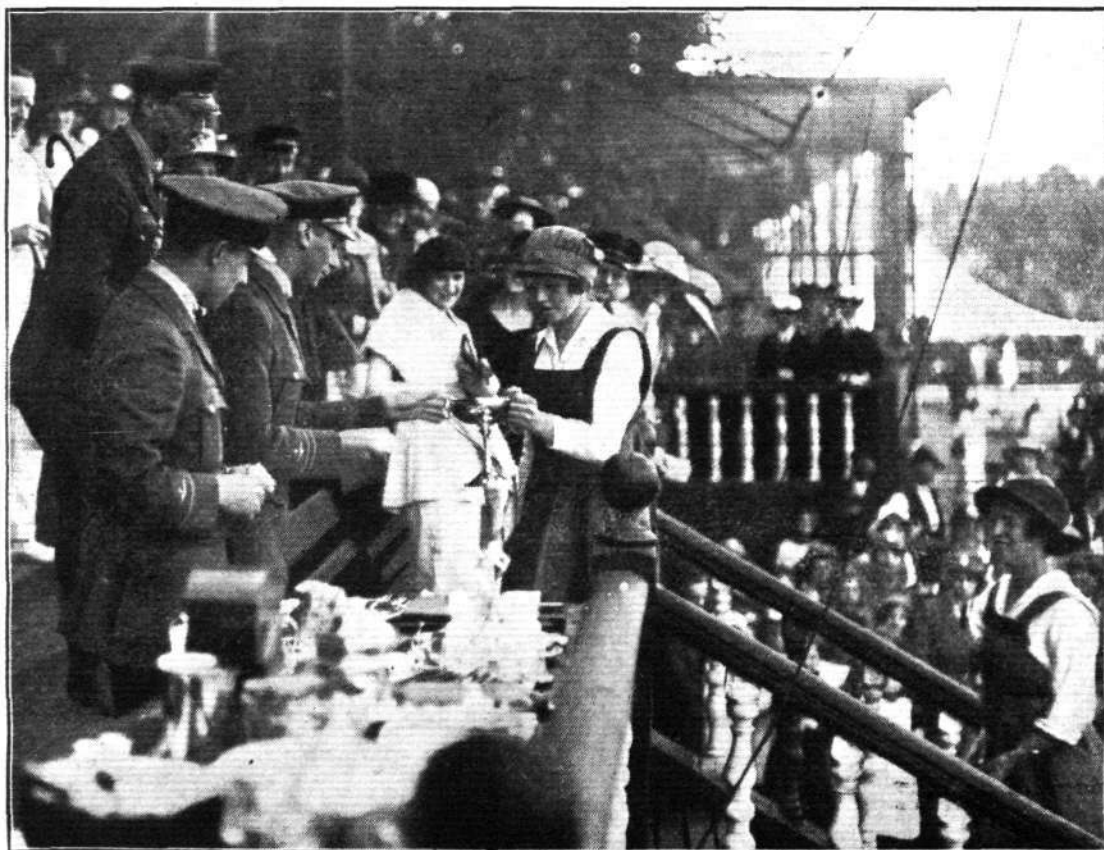
WHAT will happen presently if the fraudulent swell turns pilot and brings the plane into his scheme of operations? One can well imagine a nervous passenger being suddenly called upon, away up in the blue, to sign blank cheques or other valuable obligations upon blood-curdling threats from the man at the wheel, calmly complying, whilst —, but there we will not anticipate the consequences of the thrilling incident as worked out in the next few hundred novels and plays of the moment. Let the respective authors apologise themselves.

If a Canadian deponent is to be believed the plane is apparently not going to take all the "stunting" at its expense lying down. According to a correspondent from the other side a remarkable occurrence took place recently at London (Ontario) when a biplane and a motor car came to loggerheads within the City limits. The biplane it appears had recently been purchased in Toronto by two American aviators, Donald Whistler and E. T. Webster, both of Elkhart (Indiana). They were flying from Toronto to Elkhart by easy stages, and landed at London in a small field which gave them little opportunity to rise. A neighbouring farmer in a large touring car with seven passengers stopped to watch the aircraft rise. The passengers alighted to get a better view. The biplane caught the top of a tree when rising, toppled, and fell squarely on the top of the car less than 15 seconds after the passengers had left it. The air machine straddled across the car and released the brakes. The car ran away with the biplane and collided with another car, when it stopped. Both the cars and the aeroplane were badly wrecked, but no persons were injured.

In our opinion it thoroughly served the plane right.

A CORRESPONDENT asks if the Order of the Kamal (First Class), which has just been conferred upon Lady Allenby, has anything to do with Mr. T. O. M. Sopwith. Perhaps some of our readers might be able to help. In the meantime we have referred the enquirer to Sultan Hussein, as we have reason to believe he has made quite a study of humps in the past.

AUSTRALIA and New Zealand are, without doubt, countries of great glory and possibilities. But they have had rabbits to contend with until they have become almost a menace to Society. Now it is parrots—to wit, the Kea—in New Zealand which is causing a veritable panic amongst sheep-owners, according to Mr. Horace Hutchinson writing in the *Westminster Gazette*. And in giving voice to the existence of this plague, Mr. Hutchinson also puts forward a suggestion for a remedy. It is once more the aeroplane. In their onslaught upon the wretched sheep, the writer says "the demons come in flocks, shrieking. They do their deeds of death, eat their meals of quivering hot flesh; then back they go shrieking to their mountains. It is said that their resting-places have not been located in these fastnesses. The few that can be killed by shooting make no impression worth counting on their total. They increase not only in number, but also in boldness and in the badness of their ferocity and appetite for flesh, and, further, in the distance, from their native mountains, to which they will travel down to prey on the sheep. One hardly likes to think what the end of



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Prince Albert  
presents the  
prizes to the  
Captains of the  
Tug-of-War  
teams at the  
R.A.F. (South-  
Eastern Area)  
Sports at Queen's  
Club.

it is to be. We find, or we suggest, a solution for many troubles, and possibilities of comfort without limit, in that blessed word "aeroplane." Is it just conceivable that by means of aeroplanes the nurseries of these demons may be discovered, no matter behind what inaccessible mountain walls they be guarded, and that chemistry, in the form of poison gas, and mechanics, joining hands, may find means to destroy

the accursed brood? It is an urgent matter, and it is a matter on which it would be very bad economy not to spend money with all reasonable liberality, if there be any reasonable hope of abating a pest so deadly."

So here's another suggested opening for the 'plane to get its work in, without having to court comment as an unsportsmanlike proceeding.

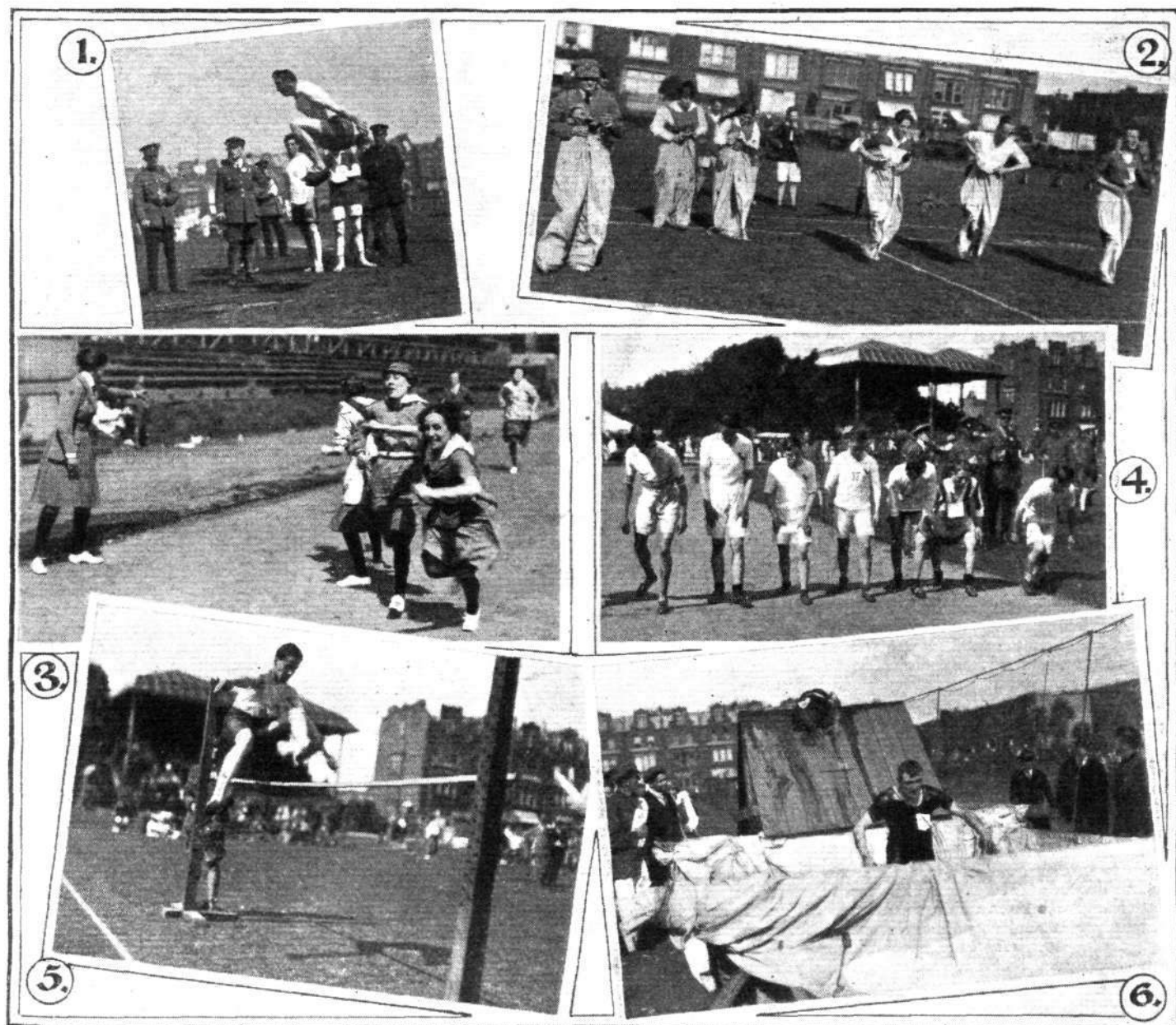
## R.A.F. SPORTS AT QUEEN'S CLUB

WITH the view of selecting representatives for the R.A.F. athletic championships to be held at Stamford Bridge on the 21st inst., a series of trials was held by the South-Eastern Area at Queen's Club, Kensington, on August 6. Capt. H.R.H. Prince Albert was present, and at the conclusion presented the prizes to the successful competitors. Brig.-Gen. T. J. Webb-Bowen, C.B., C.M.G., Col. A. M. Longmore, D.S.O., and Maj. Owen were also present.

Among the competitors were some well-known athletes, who made quite a good showing. Sergt. P. H. Poigndestre, the ex-champion sprinter of the Channel Islands, carried off both the 100 yards and quarter-mile races, the former by a good yard from Lieut. A. J. Moore, in 11 1-5 sec., and the latter, in which he beat Sergt. R. E. Skinner by five yards, in 54 3-5 sec. Air-Mech. J. Pratt, of the Horsham and the Surrey A.C., won the mile and three miles very easily. In both events

Pratt made his own pace throughout, and his times of 4 min. 51 3-5 sec. for the mile, and 16 min. 26 1-5 sec. were, therefore, good.

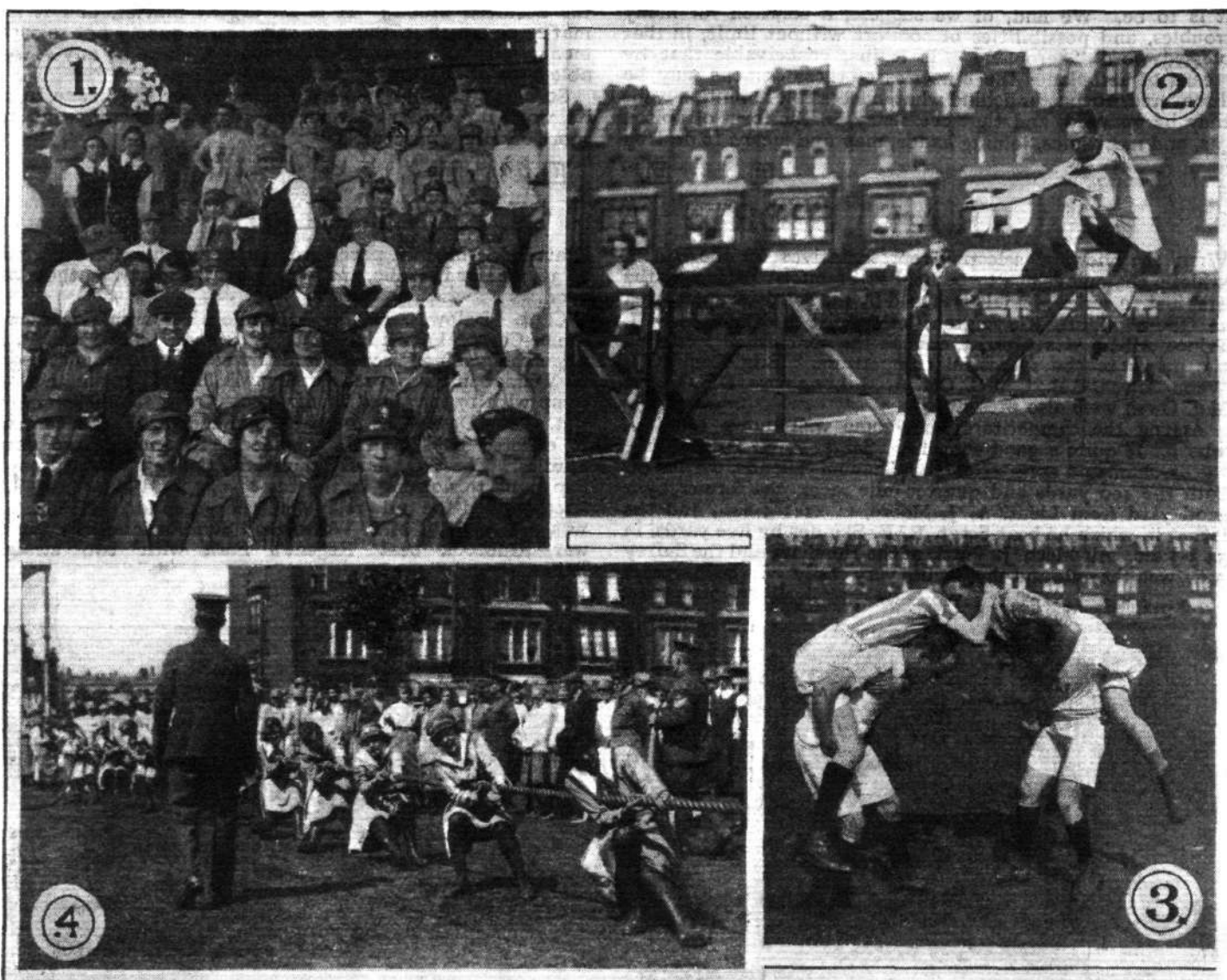
Capt. Marlowe won the half-mile after a fine race with Lance-Corporal Cook in 1 min. 57 4-5 sec.; Air-Mech. F. R. Aggersberg gained the 220 yards by half a yard from Corporal P. Wilmot in 24 1-5 sec.; Sergt. Bellingham took the long jump with 17 ft. 7 in.; L. Air-Mech. Owen the high jump at 5 ft.; Boy Downs the 100 yards and 220 yards races confined to enlisted boys, and L. Air-Mech. Kitson the 120 yards hurdles. The S.D. Earls Court beat the 143rd Squadron E. two pulls to nothing in the tug-of-war, and the Sixth S.D. Ascot gained the mile relay. A relay race for the W.R.A.F. was won by N. 1 M.T. Wormwood Scrubbs, and in a tug-of-war Kidbrook beat Regent's Park with two straight pulls.



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R.A.F. (SOUTH-EASTERN AREA) SPORTS AT QUEEN'S CLUB, AUGUST 6: 1. Long Jump; Flight-Sergt. Bellingham was an easy winner. 2. Sack Race, in which the men scored an easy victory over the girls. 3. W.R.A.F. Relay Race; "Changing over." 4. Start of the One-Mile Flat Race. 5. High Jump; H. Kelcey, who last year broke two ribs in his efforts to excel. 6. Obstacle Race; over the top of a greasy inclined board into a water trough, a tough problem for several competitors.





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R.A.F. (SOUTH-EASTERN AREA) SPORTS AT QUEEN'S CLUB, AUGUST 6 : 1. A group of spectators and competitors in the stands. 2. 120 Yards Hurdles; winner (on right) soon established a good lead. 3. "Mounted" Wrestling. 4. Tug-of-War; the W.R.A.F. team from Earl's Court pulled well.



## Where the Money Goes !

In the debate on the Consolidated Fund Bill in the House of Commons on August 7, Mr. Atkey, as one instance of wasteful Government methods, said he had received a letter from Sir James McCraith, a man, whose name stood high in the civic life of Nottingham, in which he said : " There is really such a wicked sample of the present Government waste of public money that I feel you ought to know of it. The facts are that the local anti-aircraft service is still kept in full swing with a colonel and other officers, and only about two months ago another gun was actually put up at Wilford."

Mr. Atkey said he could assure the Government that during the War that gun would have been very heartily welcomed at Nottingham. It was interesting to note that at the time when they were suffering shock from nerves owing to air-raids on Nottingham, there were no guns. Now, apparently, it was in accordance with up-to-date War Office methods that they proceeded to fortify Nottingham. The letter continued :

" Naturally both officers and men are here with practically nothing whatever to do. The general feeling of condemnation of those responsible is intense, and if I were you I would not only ask a question in the House but, if necessary, move the adjournment. Surely somebody should be punished, as it would be just as sensible to send submarines up the Trent."

Mr. Chamberlain said he had sent the particulars on to the War Office for enquiry.

## The "Felixstowe Fury" Crash

Up to the time of writing there is no clear explanation of the disaster which overtook the "Felixstowe Fury," the five-engined triplane flying-boat designed by Colonel J. C. Porte, on Monday. It appears that the machine, which has been

extensively tested during the past few months, was starting off on a trial flight preparatory to going to Plymouth, the first stage of a journey which would probably have been continued to the Cape. She started from Felixstowe at 9.15 a.m., made towards Landguard Point and then turned to get a favourable wind, but apparently there was some difficulty in clearing the buoys and also a river boat. After rising to about 10 feet the huge machine side-slipped and crashed to the water. Lieutenant S. E. S. MacLeod, who was strapped in, was drowned before he could be released. The other members of the crew—Colonel T. S. M. Fellowes, officer in charge, Major R. Moon, D.S.O.; Captain C. L. Scott, D.S.C., pilots; Lieutenant J. S. Armitt, and Mechanics Locker and Coburn were rescued little the worse for their experience.

## Fatal Accident at Camberley

WHILE a large aeroplane which had flown over from Hounslow was landing on the football ground at the Royal Military College, Sandhurst, on August 6, it overturned. The pilot Capt. Hastings was killed, and Maj. Phillips and another passenger were so seriously injured as to necessitate their removal to Aldershot hospital, but the mechanic was able to go back to Hounslow by train.

## Fatality at Westerham

AN inquest held at Biggin Hill Aerodrome on August 5 failed to show the cause of the accident on August 2, by which Lieut. A. E. Sweeting was killed and Sergt. H. Pressley was seriously injured. It appeared that the machine was being tested after the engine had been overhauled, and when coming down, apparently to land, it suddenly nose-dived from a height of 30 ft. The Coroner returned a verdict of "Death from Misadventure" through the machine nose-diving when on a practice flight.

## CIVILIAN FLYING

### BLACKPOOL AND SOUTHPORT

THE five-seater Avros signified their arrival at Blackpool by setting up new records last week, nearly 500 passengers being flown in one day by three pilots—some flying! The holiday crowds have now arrived, and evince the keenest interest in the performance of the aeroplanes. Thousands throng the beach all day long looking for the day when flights will be 5s. each.

Last Saturday flying at Southport continued until 10 p.m., and even then there were a few more couples anxious to book a trip in the moonlight.

### RHYL

THREE Avro pilots have been kept busy all the week. Members of the Rhyl Council have led the way in flying, and have rendered every possible assistance to the scheme.

It is hoped that when the Air Ministry's licence for the Moorfa Ground, Conway, is granted, a special service will be inaugurated between Rhyl and Conway. The Moorfa is an excellent centre for all North Wales, Llandudno, Conway, Colwyn Bay being within a few miles of the landing ground.

### DOUGLAS-WINDERMERE FLIGHTS

CAPT. PIXTON did very well last week in delivering his 30,000 *Daily News* daily to Douglas, and great crowds have awaited the arrival of the papers each day. The weather was not always kind, as on occasions he had to battle with 40 m.p.h. winds, but he got through to time despite them and a certain amount of mist. The flight has been so successful, that it is proposed to continue it. A standard Avro seaplane is used, but with a special compartment arranged for papers instead of the usual passenger accommodation.

### MORECAMBE AND FLEETWOOD

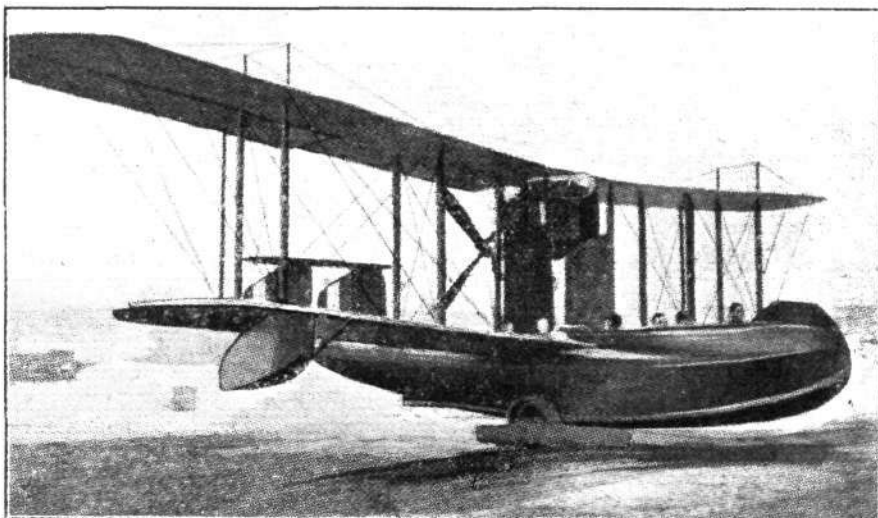
LIEUT. MACRAE, M.C., has had as much as he can do at these resorts.

On Thursday last the visibility was so remarkable that pilots could see the Isle of Man, all North Wales and Anglesey, Chester, Runcorn, into Yorkshire, far beyond Ingleborough, and away past Barrow into Scotland for a few thousand feet. It was one day in a thousand from the flying point of view.

An interesting Benzol test on a 110 h.p. Le Rhone Avro Scout has just been completed in Lancashire. The results closely follow what has already been found out in connection with motor cars using this fuel.

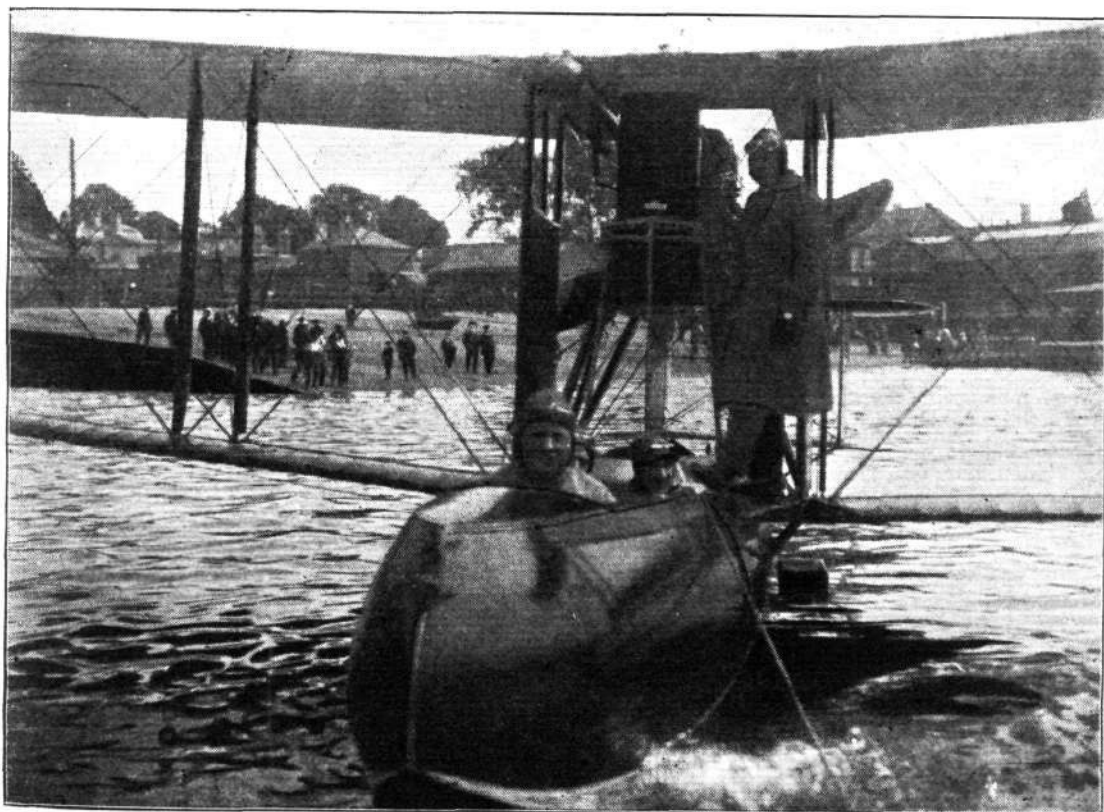
### BOURNEMOUTH AND THE ISLE OF WIGHT

AN extensive programme of pleasure flying trips has been inaugurated recently by the Supermarine Aviation Co. of Southampton. Bournemouth was the first centre of these activities, and visitors at this place enthusiastically availed themselves of the opportunity of enjoying the thrills of over-



Three-quarter front view of the Supermarine "Channel"-type flying boat which is being used for joy flips at Bournemouth, Southampton and the Isle of Wight

water flying. Besides the ordinary daily joy flips around the immediate vicinity of Bournemouth itself—embarkation, etc., taking place from the pier—trips are also made to various towns in the Isle of Wight, and a daily service is run between Southampton and Bournemouth. As soon as the necessary regulations are framed the service will be extended to the North Coast of France, calling at Le Havre, Cherbourg, and St. Malo. The four-seater Channel-type supermarine flying boat (160 h.p. Beardmore) is being employed for these trips.



The Supermarine "Channel"-type flying boat, with Mr. and Mrs. Harry Tate and Mr. R. Tate on board ready for a flight. Comdr. B. D. Hobbs, D.S.O., D.S.C., the pilot, is standing beside the engine



# THE ROYAL AIR FORCE

London Gazette, August 5.

## Permanent Officers. Promotions.

To be Air Commodores:—A. V. Vyvyan, C.B., D.S.O., P. W. Game, C.B., D.S.O., O. Swann, C.B., C.B.E., F. R. Scarlett, C.B., D.S.O.; Aug. 1. C. L. Lambe, C.B., C.M.G., D.S.O., J. M. Steel, C.M.G., C.B.E., C. A. H. Longcroft, C.M.G., D.S.O., A.F.C., T. I. Webb-Bowen, C.B., C.M.G., L. E. O. Charlton, C.B., C.M.G., D.S.O., D. le G. Pitcher, C.M.G., D.S.O.; Aug. 5.

To be Group Capt.:—C. R. Samson, R. H. Clark-Hall, T. C. R. Higgins, A. M. Longmore, I. M. Bonham-Carter, O.B.E.; Aug. 5.

The following appointments are made:—

**Directors.**—P. W. Game, C.B., D.S.O., C. L. Lambe, C.B., C.M.G., D.S.O., R. M. Groves, C.B., D.S.O., A.F.C.; Aug. 1.

**Dep. Dir., 1st Cl.**—F. C. Halahan, C.M.G., D.S.O., M.V.O.; Aug. 1.

**Dep. Dir., 2nd Cl.**—I. M. Bonham-Carter, O.B.E., and to be Dep. Dir., 1st Cl.; Aug. 5. E. R. Ludlow-Hewitt, C.M.G., D.S.O., M.C., C. L. N. Newall, C.M.G., A.M., C. L. Courtney, C.B.E., D.S.O.; Aug. 1.

The following temporary appointments are made at the Air Ministry:—

**Staff Officer, 2nd Cl. (T.).**—Capt. T. G. Skeats; Aug. 1.

**Staff Officer, 3rd Cl. (T.).**—Sec. Lieut. C. Y. Mitchell; Aug. 1, vice Capt. T. G. Skeats.

The following temporary appointments are made:—

**Staff Officer, 1st Cl. (Air).**—Lieut.-Col. G. M. Griffith; March 31.

**Staff Officer, 2nd Cl. (P.).**—Maj. R. C. Lane; July 31.

**Staff Officers, 3rd Cl. (P.).**—Capt. H. R. Kavanagh; July 8, vice Capt. L. A. K. Butt; Capt. A. J. W. Barmby, O.B.E.; July 31, from S.O. 2.

## Flying Branch.

Lieut.-Col. (actg. Brig.-Gen.) P. L. W. Herbert, C.M.G., to be Lieut.-Col. (A.) from (S.O.), and relinquishes actg. rank of Brig.-Gen.; June 18.

Lieut.-Col. L. W. B. Rees, V.C., M.C., A.F.C., to be Lieut.-Col. (A.) from (S.O.); July 25.

Maj. R. B. B. Colmore, O.B.E., to be Maj. (A.) from (S.O.); May 12.

Capt. E. C. Emmett, M.C., D.F.C., to be actg. Maj. whilst emplyd. as Maj. (A.); May 1.

Capt. K. B. S. Greig to be graded for purposes of pay and allices. as Maj. whilst emplyd. as Maj. (K.B.); May 1.

Capt. F. Workman, M.C., to be Capt. (A.) from (T.); April 23.

Capt. A. J. H. MacColl to be graded for purposes of pay and allices. as Capt. whilst emplyd. as Capt. (A'ship); March 5.

Lieut. J. P. Morkham to be actg. Capt. whilst emplyd. as Capt. (A.); Nov. 25, 1918.

Sec. Lieut. H. E. Crane is antedated in his appt. as Sec. Lieut. (A. and S.); May 11, 1918.

The following relinquish their commns. on ceasing to be emplyd.:—Sec. Lieut. W. R. Gray (Sec. Lieut., Shrops. L.I.); Aug. 9, 1918. Lieut. (Hon. Capt.) A. B. Fairclough, M.C. (Capt., Can. M.G.C.), Capt. J. H. Scandrett (Capt., Can. Fd. Art.); April 14. Sec. Lieut. (Hon. Capt.) H. E. Paquin (Capt., Quebec R.); April 19. Sec. Lieut. (Hon. Lieut.) H. McA. Peacock (Capt., R.F.); April 23. Lieut. (Hon. Capt.) G. W. Taylor (Lieut., Can. Dragoons); April 27. Sec. Lieut. C. R. Fraser (Lieut., Can. Engrs.); May 15. Lieut. W. A. Scott (Lieut., Can. Forestry Corps); May 31. Sec. Lieut. L. C. L. Cook (Sec. Lieut., R.A.S.C.); June 7. Lieut. A. Grundy (Lieut., Brit. Columbia R.); June 27. Sec. Lieut. E. H. D. Fowler (Lieut., Midd'x. R.), Lieut. R. C. D. Oliver (Sec. Lieut., R. Berks R.); July 1. Sec. Lieut. (Hon. Lieut.) A. C. Lobley (Lieut., E. Ont. R.); July 7. Sec. Lieut. (Hon. Lieut.) P. R. Cook (Lieut., R.F.A.); July 8. Capt. W. A. C. Heyman (Lieut., Hussars); July 24. Capt. F. R. Alford, M.C. (Capt., Can. M.G.C.); July 27. (Then follow the names of 124 officers who are transfd. to the Unemployed List under various dates. We regret that owing to great pressure on our space, it is impossible to reprint this portion of the List.—Ed.)

The following Capt. relinquish their commns. on account of ill-health and are permitted to retain their rank:—C. Lawrence, R. E. Spear (contracted on active service); July 25.

The following Lieuts. relinquish their commns. on account of ill-health and are permitted to retain their rank:—S. F. Napper; June 15, substituted for the notification in the *Gazette* of June 27. W. G. Kewley (contracted on active service); July 5.

Lieut. L. F. Short (K.O.Y.L., T.F.) resigns his commn. on account of ill-health caused by wounds; July 23.

Sec. Lieut. R. C. Williams (Sec. Lieut., Hussars) resigns his commn., and is permitted to retain his rank; Aug. 6.

The initials of Sec. Lieut. D. E. Waight (Northumberland Fs.) are as now described, and not "W. G.," as stated in the *Gazette* of May 20.

The initials of Sec. Lieut. C. A. Muir are as now described, and not "J. A.," as stated in the *Gazette* of June 3.

The initials of Lieut. W. Partridge are as now described, and not "N.," as stated in the *Gazette* of June 27.

The notification in the *Gazette* of Dec. 31, 1918, concerning Sec. Lieut. H. Brooks is cancelled.

The notifications in the *Gazette* of April 4 concerning the following officers are cancelled:—Sec. Lieut. J. Collins (Rifle Bde.), Sec. Lieut. J. F. J. Peters.

The notification in the *Gazette* of April 29 concerning Lieut. R. Milner is cancelled.

The notifications in the *Gazette* of June 27 concerning the following officers are cancelled:—Capt. F. W. J. V. Fraser, O.B.E., M.C., Lieut. W. H. S. Towell, Sec. Lieut. (Hon. Lieut.) L. S. Dell.

The notification in the *Gazette* of July 4 concerning Lieut. N. B. Lovemore is cancelled.

The notification in the *Gazette* of July 15 concerning 475312 G. C. Boyer is cancelled.

The notifications in the *Gazette* of July 29 concerning the under-mentioned officers are cancelled:—Lieut.-Col. F. C. Sheldermine, Lieut. J. E. G. Mosby.

The Christian names of Sec. Lieut. Edward Harry Sansom are as now described, and not "Edward Parry Sansom," as stated in the *Gazette* of Sept. 10, 1918.

The notification in the *Gazette* of Oct. 25, 1918, concerning 475312 G. Boyer is cancelled.

## Administrative Branch.

Capt. N. A. Daniell to be graded for purposes of pay and allices. of Maj. whilst emplyd. as Maj.; May 1.

Cpts. to be Cpts.:—A. Ridley from (S.O.); June 2. J. W. Carter from (T.); July 20.

Lieuts. to be actg. Cpts. whilst emplyd. as Cpts.:—H. B. Dakin; May 1. R. J. L. Gerard; July 22.

Lieuts. to be graded for purposes of pay and allices. as Cpts. whilst emplyd. as Cpts.:—I. Morgan, Jan. 12. (Hon. Capt.) R. A. Shepherd-Walwyn; May 1.

Lieut. (actg. Capt.) I. Morgan to be Lieut. from (K.B.) and to retain the actg. rank of Capt. (without pay and allices. of that rank) whilst emplyd. as Capt.; Nov. 17, 1918.

Lieuts. to be Lieuts.:—H. V. Lewis, from (A.); July 9. L. E. M. Gillman, from (S.O.); Aug. 1.

G. D'A. W. Oliver (Lieut., Wilts R.) is granted a temp. commn. as Lieut.; July 20, 1918.

Sec. Lieuts. to be Lieuts.:—(Hon. Capt.) C. S. Burdon; April 2, 1918. J. H. Thompson; Dec. 21, 1918.

Sec. Lieut. F. C. Matten to be actg. Lieut. whilst emplyd. as Lieut. from Jan. 1 to April 30.

Sec. Lieut. J. Fughe-Jones to be Sec. Lieut., from (A.); Feb. 3, substituted for the notification in the *Gazette* of Feb. 4.

The follg. relinquish their commns. on ceasing to be emplyd.:—Sec. Lieut. (Hon. Lieut.) L. S. Dell (Lieut., R.F.A.); May 14. Lieut. W. H. S. Towell (T./Pmr. Sub-Lt., R.N.); June 6.

(Then follow the names of 40 officers who are transfd. to the Unemployed List under various dates.)

Lieut. J. J. Coleman relinquishes his commn. on acct. of ill-health contracted on active service, and is permitted to retain his rank; July 25.

Sec. Lieut. H. V. A. Salter relinquishes his commn. on acct. of ill-health, and is permitted to retain his rank; July 25.

The notification in *Gazette* of July 1 concerning Lieut. H. W. Sidley is cancelled.

The notification in *Gazette* July 29 concerning Maj. R. B. B. Colmore, O.B.E., is cancelled.

The notification in *Gazette* Nov. 5, 1918, concerning Sec. Lieut. H. G. G. Rawlings is cancelled.

## Technical Branch.

Capt. F. R. Williams to be actg. Maj. while emplyd. as Maj., Grade (A); May 1.

Cpts. to be graded for purposes of pay and allices. as Maj. whilst emplyd. as Maj., Grade (A.):—T. Temple; April 1. F. Workman, M.C., from (A.); May 1.

Capt. E. R. Whitehouse to be Capt., Grade (A.), from (Ad.); April 11.

Cpts. to be Cpts., Grade (B):—F. Workman, M.C., from (A.); May 9, 1918. A. J. Woodhouse, from (S.O.); May 30.

Lieuts. to be actg. Cpts. whilst emplyd. as Cpts., Grade (A.):—L. E. Yeomans; Sept. 18, 1918. T. G. S. Babb, from March 8 to April 30. P. Burke; May 1.

Lieut. J. W. Gardner to be Lieut., Grade (A.), from (Ad.); May 19.

Lieut. H. W. Sidley to be Lieut., Grade (B.) from (S.O.); May 23.

Lieuts. to be graded for purposes of pay and allices. as Lieuts. whilst emplyd. as Lieuts., Grade (A.):—(Hon. Capt.) J. R. Cassidy; from Aug. 22, 1918, to Jan. 10. T. G. S. Babb; from Feb. 24 to March 7; J. V. Yates; March 8.

Sec. Lieut. H. G. G. Rawlings (late Gen. List, R.F.C., on prob.) is confirmed in rank as Sec. Lieut., Grade (B.); Nov. 1, 1918.

The following relinquish their commns. on ceasing to be emplyd.:—Sec. Lieut. H. A. Cole (Sub-Lieut., R.N.V.R.); June 17. Sec. Lieut. (Hon. Capt.) W. W. W. Reilly (Capt., Connaught Rangers); July 29.

(Then follow the names of 28 officers who are transfd. to the Unemployed List under various dates.)

Maj. C. L. Hope relinquishes his commn. on account of ill-health, and is permitted to retain his rank; July 25.

The rank of Sec. Lieut. (acting Lieut.) A. Morison is as now described, and not Sec. Lieut. as in *Gazette* Jan. 24.

The notification in *Gazette* July 8 concerning Sec. Lieut. H. G. G. Rawlings is cancelled.

The notification in *Gazette* April 25 concerning Lieut. D. Gordon is cancelled.

## Medical Branch.

Maj. A. Fairley (Surg.-Lieut.-Comm., R.N.) relinquishes his commn. on ceasing to be emplyd.; July 19.

Transferred to Unempld. List:—Lieut. A. J. Swanton; Feb. 28. Capt. J. Freeman; April 15. Capt. C. C. O'Malley; May 13. Capt. (Hon. Maj.) D. Wilson; July 14. Lieut.-Col. T. Philip; July 15. Capt. A. Sutcliffe; July 16.

## Memoranda.

Lieut.-Col. B. C. Fellows, C.M.G. (Br. Maj., Remount Service) (ret. Ind. Army), is granted the hon. rank of Brig.-Gen.; March 19.

Sec. Lieuts. to be Hon. Cpts.:—(Hon. Lieut.) R. Blackith; Oct. 7, 1918. F. J. Smith; Jan. 14. W. Blake; May 29.

(Then follow the names of 10 Overseas Cadets granted temp. commns. as Sec. Lieuts., and 185 Cadets granted Hon. Commns. as Sec. Lieuts.)

The follg. gentlemen are granted hon. commns. as Sec. Lieuts.:—A. G. Bethel, W. A. Dunhill, H. M. Lane, G. Mitchell, G. F. Mullin, H. L. Overton, B. S. Kyrie, J. W. Shand, E. Roberts; Aug. 5.

Capt. F. W. I. V. Fraser, O.B.E., M.C. (Capt. Seaforth Highrs.), relinquishes his commn. on ceasing to be emplyd.; June 12.

(Then follow the names of 4 officers who are transfd. to the Unemployed List under various dates.)

The follg. Cpts. (actg. Maj.) relinquish their commns. on account of ill-health, and are permitted to retain the rank of Maj.:—A. E. Hawker Feb. 5, substituted for notification in *Gazette* of Feb. 4. P. le G. Gribble from (S.O.); April 19, substituted for notification in *Gazette* of July 15.

Lieut. W. E. Rubens (Essex R., T.F.) relinquishes his commn. on account of ill-health contracted on active service; July 1.

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## Permanent Officers.

### Promotions.

To be Air Commodores:—R. M. Groves, C.B., D.S.O., A.F.C., E. A. D. Masterman, C.M.G., C.B.E., A.F.C.; Aug. 8.

To be Group Capt.:—P. L. W. Herbert, C.M.G., J. G. Hearson, C.B., D.S.O., E. R. Ludlow-Hewitt, C.M.G., D.S.O., M.C.; U. J. D. Bourke, C.M.G., C. L. N. Newall, C.M.G., A.M., A. E. Borton, C.M.G., D.S.O., A.F.C.; Aug. 8.

The following appointments are made:—

**Deputy-Directors, 1st Cl.**—Group Capt. E. R. Ludlow-Hewitt, C.M.G., D.S.O., M.C., Group Capt. C. L. N. Newall, C.M.G., A.M.; Aug. 8.

The following temporary appointments are made:—

**Staff Officer, 2nd Cl.**—Maj. J. Gaskell-Blackburn; July 1, from S.O. 1.

**Staff Officer, 3rd Cl.**—Sec. Lt. (Hon. Lieut.) L. Miller; Jan. 13.

**Air Attache.**—Lieut.-Col. R. A. Cooper, D.S.O.; May 1, vice Lieut.-Col. C. H. Meares.

## Flying Branch.

Capt. J. H. Green to be graded for purposes of pay and allowances as Capt. while emplyd. as Capt. (A.); May 1.

Capt. J. H. Green to be graded for purposes of pay and allowances as Lieut. while empld. as Lieut. (A.); Sept. 27, 1918.

Sec. Lieut. F. C. Rayson to be Lieut.; May 28.

Sec. Lieut. S. C. Paice (late Gen. List, R.F.C., on prob.) is confirmed in rank as Sec. Lieut. (A.); May 1, since killed, substituted for notification in *Gazette*, June 3.

H. C. Harris is granted a temp. commn. as Sec. Lieut. "O."; Nov. 4, 1918.

Lieut. E. H. P. Jolley (Sec. Lieut. (temp. Lieut.), I.A.R.O.) relinquishes his commn. on reversion to I.A.R.O.; Aug. 7.

The following relinquish their commns. on ceasing to be empld.:—Lieut. V. S. Bennett (Lieut. (actg. Capt.), R. Newfoundland R.); July 3. Lieut. S. B. Nelson (Lieut., E. Ont. R.); July 23. Lieut. W. G. Jewitt (Lieut., E. Ont. R.); July 24. Lieut.-Col. E. B. Gordon, C.M.G., D.S.O. (Maj. and Bt. Lt.-Col., North'd Fus.); July 26. Lieut. A. Rose, M.M. (Lieut., Alberta R.); July 29. Sec. Lieut. (Hon. Lieut.) A. H. Bill (Lieut., Sask. R.); July 30. Capt. S. H. Long, D.S.O., M.C. (Lieut., D.L.I.); July 31. Maj. A. V. Holt, D.S.O. (Capt., R. Highrs.); Aug. 4.

(Then follow the names of 87 officers who are transfd. to the Unemployed List under various dates. We regret that owing to great pressure on our space, it is impossible to reprint this portion of the List.—Ed.)

Lieut.-Col. C. E. C. Rabagliati, M.C. (Capt., Bt. Maj., K.O.Y.L.I.), resigns his commn. and is permitted to retain his rank; Aug. 6.

The follg. Capts. relinquish their commns. on account of ill-health and are permitted to retain their rank:—W. D. M. Bell, M.C. (contracted on active service); April 11, 1918. J. A. Hutchison; May 20, substituted for the notification in the *Gazette* of Jan. 24.

The following Lieuts. relinquish their commns. on account of ill-health, and are permitted to retain their rank:—F. N. Grimwade; April 18, 1918 (substituted for the notification in the *Gazette* of Sept. 6, 1918). R. Coop (caused by wounds); June 6.

Lieut. S. Carlin, M.C., D.F.C., D.C.M. (R.E., T.F.), relinquishes his commn. on account of ill-health contracted on active service; Aug. 7.

Lieut. W. L. C. White to take rank and precedence as if his appointment as Lieut. bore date Oct. 1, 1918.

The initials of Lieut. F. P. O. Mann are as now described, and not "F. O." as stated in the *Gazette* of June 17.

The notification in the *Gazette* of March 21 concerning Sec. Lieut. W. S. Vipond (Lieut., Canadians) is cancelled.

The notification in the *Gazette* of April 8 concerning Lieut. S. D. Morrison (Nova Scotia R.) is cancelled.

The notification in the *Gazette* of July 15 concerning Capt. G. H. Morton (Brit. Col. R.) is cancelled.

#### Administrative Branch.

Sec. Lieut. (Hon. Lieut.) E. Meynell, D.C.M., to be actg. Capt. while empld. as Capt.; May 1.

Lieut. H. Harker to be Lieut. from (A.); July 25.

F. R. C. Davidson (Lieut., Montgomery Yeos., T.F.) is granted a temp. commn. as Lieut.; Aug. 1, 1918, with seniority from April 1, 1918.

The following relinquish their commns. on ceasing to be empld.:—Capt. (Hon. Maj.) H. R. P. Reynolds (Capt. (Bt. Maj.), R.E.); June 17. Lieut. J. E. H. Bibby. June 30.

(Then follow the names of 20 officers transfd. to the Unemployed List under various dates.)

Sec. Lieut. L. MacK. Lockhead relinquishes his commn. on account of ill-health, and is permitted to retain his rank; July 29.

The rank of Lieut. H. A. Maynard is as now described, and not Capt., as stated in the *Gazette* of June 17.

The notification in the *Gazette* of June 17 concerning Lieut. L. H. Hillier is cancelled.

The notification in the *Gazette* of July 22 concerning Lieut. (Hon. Capt.) T. E. Gentles is cancelled.

#### Technical Branch.

Maj. S. S. Nevill, O.B.E., to be actg. Lieut.-Col. whilst empld. as Lieut.-Col., Grade (A.); May 1.

Lieut. C. H. Boyle to be actg. Capt. whilst empld. as Capt., Grade (B.); May 29.

Lieut. L. H. Hillier to be Lieut. (Grade A.), from (A.); Sept. 23, 1918.

Sec. Lieut. J. Penrose to be Lieut., without pay and allices. of that rank; Jan. 15.

Sec. Lieut. (Hon. Lieut.) (actg. Capt.) F. McGuffie to be Sec. Lieut. (Hon. Lieut.), Grade (B.), and to relinquish the actg. rank of Capt., 11cm (S.O.) (March 5), substituted for the notification in the *Gazette* of July 29.

(Then follow the names of 15 officers transfd. to the Unemployed List under various dates.)

Maj. E. J. Parker, M.C., to take rank and prec. as if his appt. as Maj. bore date Oct. 1, 1918.

Sec. Lieut. J. P. Clark resigns his commn.; Aug. 9.

The surname of Lieut. H. W. K. Jennings is as now described, and not "Jellings," as stated in the *Gazette* of June 3.

The rank of Lieut. E. P. Proud is as now described, and not as stated in the *Gazette* of April 4.

The notification in the *Gazette* of April 4 concerning Lieut. W. F. Mytton is cancelled.

The notification in the *Gazette* of July 1 concerning Lieut. J. Hooper is cancelled. The notification in the *Gazette* of July 11 to stand.

#### Medical Branch.

Lieut.-Col. H. E. South (Fleet Surgeon, R.N.) relinquishes his commn. on ceasing to be empld.; May 19.

Transferred to Unempld. List:—Capt. T. H. James; June 22. Capt. (actg. Maj.) C. J. G. Taylor; Aug. 1.

#### Dental Branch.

G. Packman is granted a temp. commn. as Capt.; Aug. 1.

The following are granted temp. commns. as Lieuts.:—P. E. Bernard, R. H. More; Aug. 1.

#### Chaplains Branch.

The Rev. H. E. Ruddy, M.A., is transferred to Unempld. List; July 28.

(Then follow the names of 261 Overseas Cadets granted hon. commns. as Sec. Lieuts.)

Lieut.-Col. A. Christie, C.M.G., D.S.O. (Capt. (temp. Lieut.-Col.), Royal R. of Artillery), relinquishes his commn. on ceasing to be empld.; Aug. 2.

(Then follow the names of 8 officers transfd. to the Unemployed List under various dates.)

Capt. C. H. S. Taylor relinquishes his commn. on account of ill-health contracted on active service, and is granted rank of Lieut.-Col.; June 30.

The notification in *Gazette* April 29 concerning Maj. J. W. K. Allsop is cancelled.

The notification in *Gazette* July 18 concerning H. P. MacDonald is cancelled.



## AVIATION IN PARLIAMENT

### Civil Aviation Department Salaries

MR. JOYNSON-HICKS, in the House of Commons on August 8, asked the Under-Secretary of State to the Air Ministry if he can make a statement as to the names, salaries, and working of Gen. Sykes' staff in the Civil Aviation Department?

Maj.-Gen. Seely: The following members of the staff of the Civil Aviation Department are being paid the civil rates shown:—

Maj.-Gen. Sir F. H. Sykes.—£2,000 plus £500 retired pay.

Maj.-Gen. E. D. Swinton.—£1,800, less 10 per cent. deduction on account of pension.

Lieut.-Col. W. O. Raikes.—£1,000.

Mr. G. B. Cockburn.—£800.

Mr. J. M. Pearson.—£280 plus bonus.

Other gentlemen are serving in the Civil Aviation Department as officers, and these are in receipt of Staff rates of pay or pay and allowances of their rank. Letters offering civil appointments in those cases agreed by the Treasury have been sent.

### C.A.D. Organisation

CAPT. W. BENN asked the Under-Secretary of State to the Air Ministry whether he can make a statement regarding the organisation of the Civil Aviation Department, especially the training and licensing of commercial pilots?

Maj.-Genl. Seely: As regards the first part of the question, the organisation of the Department of Civil Aviation is proceeding on the general lines indicated in the Memorandum circulated amongst members by me on April 30 last. Treasury sanction has been obtained for a certain proportion of the staff provisionally asked for by the Air Ministry. Since the date of the Memorandum referred to, all the meteorological services have become part of the Department of Civil Aviation. As regards the second part of the question, the Department of Civil Aviation does not undertake the training of pilots, but it licenses pilots possessing the qualifications prescribed in the Air Navigation Regulations.

### Enforcement of Air Regulations

MR. JOYNSON-HICKS asked the Under-Secretary of State to the Air Ministry whether he is making any arrangement in the nature of an air police force for ensuring obedience to the Air Regulations?

Maj.-Gen. Seely: Arrangements have been made in order to ensure, as far as possible, that breaches of the Air Regulations are reported to the Controller-General of Civil Aviation. It is not considered that the expense involved in maintaining an air police force would be justified at the present stage.

### Hostile Air Raids (Claims)

LIEUT.-COL. ASHETON POWNALL asked the Prime Minister what action should be taken by the dependants of those killed in hostile air raids in order that their claims may be submitted to and settled by Germany, as provided by Article 232 of the Treaty of Peace?

Mr. Harmsworth: Applicants should send in particulars of their claims to the Foreign Claims Office, Foreign Office.

### R.A.F. Air Division (Naval Staff)

MR. RAPER asked the Prime Minister for what purpose the Air Department of the Admiralty is maintained?

Mr. Long: I have been asked to answer this question. I would repeat the reply which I gave on July 31 to a similar question, that there is no Air Department at the Admiralty. There is an Air Division of the Naval Staff, which advises as to air operations affecting Royal Air Force units working with the Fleet. This division is manned by Royal Air Force officers lent by the Air Ministry. I might add that this arrangement was made to meet war conditions, and the question of the best means of securing the necessary close co-operation in peace-time is at present being considered by the two Departments.

### Construction of Airships

CAPT. W. BENN asked the Under-Secretary of State to the Air Ministry whether he can make a statement explaining the Government policy relating to the transference of the construction of lighter-than-air craft from the Admiralty to the Air Ministry?

Maj.-Gen. Seely: I cannot yet add anything to the answer given on this subject by the Lord Privy Seal on behalf of the Prime Minister last Thursday.

Capt. Benn asked the First Lord of the Admiralty whether he can make a statement explaining the Government policy relating to the transference of the construction of lighter-than-air craft from the Admiralty to the Air Ministry?

Mr. Long: I am not yet in a position to add to the statement made by my right hon. friend the Leader of the House on Thursday last, July 31.

### Discharges at Henlow Aerodrome

MR. TOWNLEY, on August 7, asked the Under-Secretary of State for Air whether he is aware that 50 per cent. of the men employed at the Henlow Aerodrome have received notice to leave on August 9, and the remainder to go shortly; and whether, especially as many of these men are ex-Service men, he will take steps to suspend this notice?

The Under-Secretary of State for Air (Maj.-Gen. Seely): I only received my hon. friend's question on entering the House, and have not had time to ascertain the full facts of the case. I am aware, however, that a large number of men at Henlow are under notice to leave owing to necessary reductions. I regret extremely the inconvenience and anxiety which must be caused to the men and their families by these dismissals at Henlow and elsewhere, especially as many of the men employed have served in the field, but the great reduction in the establishments and expenditure of the Royal Air Force render these hardships unavoidable. Fifty-two aerodromes, eleven seaplane stations, 147 landing grounds, and 1,899 hired premises have been closed since the Armistice, involving an almost unprecedented reduction in expenditure and labour employed in so short a period. I am making special enquiries at Henlow, and my hon. friend may rest assured that every effort will be made there and elsewhere to mitigate the hardships resulting from the necessary reductions, while maintaining the efficiency of the Royal Air Force, which are essential in the interests of economy.

### Relinquishment of R.A.F. Aerodromes and Offices

CAPT. W. BENN asked the Under-Secretary of State to the Air Ministry what reductions have been made recently in the number of aerodromes in use and the hotels and offices occupied by the Ministry?

Major-General Seely: Between July 2 and August 6, 1919, one aerodrome, five seaplane stations and 13 landing-grounds have been notified to the



Directorate of Lands as available for relinquishment or to be disposed of, making a total of 52 aerodromes, 11 seaplane stations and 147 landing-grounds so advised since November 11, 1918. The Hotel Cecil, the only hotel now in the occupation of the Air Ministry, will be evacuated on August 13, 1919. The offices at 5, John Street, Adelphi, will be evacuated on August 9, 1919.

The following hotels and offices have been given up by the Air Ministry within the last five months:—

Cavendish Hotel, evacuated January 10, 1919.  
4/6, Adam Street, evacuated March 22, 1919.  
Adelphi Hotel, evacuated April 5, 1919.  
5 and 7, John Street, Adelphi, evacuated April 5, 1919.  
Covent Garden Hotel, evacuated April 14, 1919.

The number of hired premises in use by the R.A.F. at the date of the Armistice was 2,143; by August 1, 1919, 1,899 of these had been given up.

## Damage by Aircraft (Insurance)

SIR H. NIELD asked the President of the Board of Trade whether the existing and current policies issued under the Government scheme of insurance against damage by aircraft entitle the holders to be indemnified against damage done by Government-owned aircraft exercised and controlled by members of the R.A.F. or other services of the Crown and by civilian-owned aircraft?

MR. BRIDGEMAN: Damage caused by aircraft employed by the British Government is covered under the Government Aircraft Policy, but damage consequent upon the use of aircraft other than those under Government control or ownership is not so covered.

## Civil Aviation Conditions

SIR HERBERT NIELD asked the President of the Board of Trade whether any licence or other permit is necessary to enable civilian-owned aircraft to be exercised and flown; whether any regulations have been made with regard to the conditions under which such flying is authorised, and what, if any, security is required or other provision made for the payment of or indemnity against damage to life or injury to persons or property resulting from accidents caused by the fall of aircraft or from anything dropped from aircraft while in the course of flight; and whether there is any and what provision for the identification of such aircraft in cases where the injury is caused by anything so dropped?

MAJOR-GENERAL SEELY: The conditions governing civilian flying are laid down in the Air Navigation Regulations, 1919 (Statutory Rules and Orders, 1919, No. 525). These Regulations provide, *inter alia*, that all aircraft must be registered and bear a registration mark, that aircraft carrying passengers for hire or reward must be certified airworthy, and that all pilots flying aircraft must be licensed. There is no special provision in the Regulations as to liability in respect of accidents. Conditions are imposed as to the display of the registration mark with a view to facilitating the identification of aircraft. Damage caused by aircraft is recoverable by ordinary process of law as in the case of damage caused by any other means.

## Anti-Aircraft Station, Shipbourne

MR. BENNETT, on August 8, asked the Secretary of State for War if there is now any necessity for the anti-aircraft station at Shipbourne, Sevenoaks; and if he will give instructions for its early removal, inasmuch as the huts and gun prevent the villagers from using the village green for cricket and other accustomed sports?

MR. CHURCHILL: Instructions are about to be issued for the abolition of the anti-aircraft station at Shipbourne.

## Air Force Contracts

MR. RAPER, on August 12, asked the Under-Secretary to the Air Ministry what steps he proposed to take to punish all persons in or connected with the Air Force, no matter what their positions, found guilty of corrupt practice in connection with the Air Force contracts by the Select Committee on National Expenditure, and whether, in view of recent disclosures, he would now, without further delay, form a small committee of two or three members of the House having real business experience and two or three other experienced business men outside the House to supervise the placing and execution of all future Air Force contracts.

MAJ.-GEN. SEELY: Every possible step has already been taken and will be taken in future to bring to justice any person in, or connected with, the Air Force guilty of corrupt practices regarding Air Force contracts or in any other matter. I am not disposed to adopt the suggestion contained in the last part of the question. I intend to make a statement on the matter in the course of to-morrow's debate.

MR. RAPER: Does the right hon. gentleman propose to take steps to prosecute those referred to in the report of the Select Committee?

MAJ.-GEN. SEELY: Since I have been at the Air Ministry, wherever there has been any case of corruption I have at once given orders that a prosecution

shall take place, if a prosecution can lie. I propose to continue that practice.

MR. RAPER: Is it not a fact that, in connection with the instances mentioned in the report, the Government decided, for reasons of their own, not to institute proceedings?

MAJ.-GEN. SEELY: No, Sir. I presume my hon. friend is referring to two cases. One was the case referred to by Sir John Hunter, in which I gave instructions myself personally that a prosecution was to take place if a prosecution would lie. I gave these instructions precisely twice to Sir John Hunter, who was then acting under my directions. The Lord Advocate for Scotland decided that a prosecution would not lie. So far as the Air Ministry is concerned the facts are as I have stated, that wherever there has been the possibility of prosecution a prosecution has been ordered. The other was the case of Miss O'Sullivan, who made allegations of corruption. The very day that these allegations were brought before the Select Committee, presided over by the right hon. baronet, the member for the City of London, I ordered an inquiry to be held, which is now proceeding. If there is ground for prosecution—that is, of course, a legal matter—that prosecution will take place.

MR. G. LAMBERT: May I ask the Leader of the House whether if, with Mr. Speaker's permission, this matter is raised to-morrow as to the prosecution of these officials in the Air Service, the Lord Advocate will be here to defend his somewhat inexplicable action?

MR. BONAR LAW: I shall make inquiry, but I entirely agree with my right hon. friend that a discussion on that point would be very ineffective unless we hear the Lord Advocate's own explanation of what are his reasons.

MR. BILLING asked whether the officers named by Sir John Hunter were still in the employment of the Air Service, and, if so, what positions did they occupy?

MAJ.-GEN. SEELY: I do not carry the facts in my mind, and I must have notice of the question as to the particular officers the hon. member refers to. But I repeat that our policy has been throughout—mine especially—that wherever there could be any question of improper or corrupt dealings a prosecution is at once ordered.

MR. BILLING asked whether, having regard to the fact that the only reason that these officers had not been prosecuted was owing to a technicality, the right hon. gentleman could see that if they occupied any position of trust they should be forthwith dismissed.

MAJ.-GEN. SEELY: Certainly not. Are we to assume that a man is guilty before he is found to be so by a process of law? I cannot carry in my mind who all these people are, but in trying to do what is right in the interests of the State we must do right to the individual.

MAJ.-GEN. SEELY (in reply to a question by Mr. Briant): The information I received from the Lord Advocate was that a prosecution would not succeed. When it was suggested to me that possibly it might bring into disrepute the representatives of either Sir John Hunter or any other officials, I said at once that that had nothing whatever to do with the case, but I confess that I do not understand that particular point. The Lord Advocate is not present in the House, but no doubt it will be cleared up to-morrow. I say at once that such an idea never entered my head or the head of anyone responsible at the Air Ministry. All we want to do is to get at the truth.

SIR F. BANBURY: This matter was the subject of inquiry so long ago as March. No inquiry was granted until June, and then the inquiry was commenced but was not finished, owing to the fact that Miss O'Sullivan had not signed her evidence, and no further steps were taken until it was made evident to the Air Ministry that inquiries were going on before the Select Committee, and it was then, and then only, on the 25th of last month, that an inquiry was instituted by the Air Ministry.

MAJ.-GEN. SEELY: I have said again and again in this House that if in this matter, which affects what is called the "Douglas-Pennant case," any specific charge of corruption could be made, it would be at once inquired into. I have again and again asked for a specific statement. It was not given. The moment it was given in response to a question asked by the Select Committee that very same day an inquiry was ordered.

CAPT. WEDGWOOD BENN: Who is the Secretary of State for Air, and why is he not here to answer these matters? Will he be here to-morrow?

MR. BONAR LAW: He will certainly be here to-morrow, and I am quite sure my right hon. friend will be glad to have an opportunity of stating the policy of the Air Ministry in this matter.

MR. STEWART: If there is any prosecution possible will it be under Scottish law or English law, and is the law of evidence the same in Scotland as in England? No answer was given.

MR. MACVEAGH: Will the right hon. gentleman, in the inquiry which he is now conducting, inquire into the conduct of the official who threatened to dismiss Miss O'Sullivan for making this report?

MAJ.-GEN. SEELY: Yes, certainly.

LORD ROBERT CECIL rose, but the Speaker said that any further questions had better be left over for discussion the next day.

## A Madrid-London Flight

A BRITISH aeroplane, piloted by Major de Havilland, which was flying from Madrid to London, descended near Cherbourg on Sunday evening. The machine left for London the next morning.

## An Anglo-Spanish Aerodrome at Vittoria

THE arrangements for the starting of commercial air services in Spain are progressing and the arrival of Count Abliz at Vittoria to inspect the aerodrome established there by an Anglo-Spanish company is reported. It is also proposed to organise aerial tours.

## From Madrid to Rome

ON a S.I.A. machine the Italian pilot, Stoppani, left Madrid at 6 a.m. on August 6 and landed at Centocelle aerodrome, near Rome, at 5.45 p.m. the same day. His route during the non-stop trip of 990 miles was Madrid, Gulf of Lyons, Marseilles, Genoa, Spezia, Pisa, Rome.

The King of Spain availed himself of this means to send greetings to the King of Italy.

## Adventure with the Bolsheviks

FROM a letter written home by Lieut. Lansdowne it appears that the machine in which he and Lieut. Marshall were flying was hit when over the Bolshevik Dvina lines, and they were forced to descend on the river.

Destroying their machine they tried to swim back to the British lines, but after covering a mile they were subjected to heavy fire and had to surrender. They report that they are safe and well.

## Aerial Photography and Map Making

THE first annual dinner of photographic officers of the R.A.F. was held on Monday at the Café Royal, Major F. C. V. Laws presided, and among those present were Lieut.-Colonel J. T. C. Moore Brabazon, M.P., Major P. R. Burchall and Major Gamble.

Proposing the toast of "The Photographic Officers," the Chairman said that on the Western front it was recognised that British aerial photography was ahead of that of all the Allied forces and far in advance of that of the Germans. At least six months ago the German Air Ministry issued a statement that aerial photography was a science created by the war which they must not allow to slip from their fingers. He hoped the British Air Ministry would appreciate the value of the science as soon as possible. Every town, river, railway and road in the country ought to be photographed from the air.

The toast of "General Trenchard, Colonel Moore Brabazon and the Training Division" was also honoured.

## 32 Squadron, R.A.F.

OLD members of this squadron may care to know it is proposed to form an association for them, of which Lieut.-Col. T. A. E. Cairns, D.S.O., has consented to become President. Its headquarters are at 30, Bedford Row, London, W.C., where Mr. P. P. Nicholl is acting as Hon. Secretary, and he will be glad if all old members of the squadron will keep him posted as to their movements. He will also welcome photographs for the squadron album.

## SIDE-WINDS

THE King of the Belgians has conferred the honour of Commandeur de l'Ordre de Leopold II upon Sir Herbert Austin, managing director of the Austin Motor Co., Ltd., in recognition of "constant and generous help given to this country in the course of the War."

It was erroneously reported in several papers that the 750 h.p. Fiat aeroplane, which recently flew from Rome to London, made a crash landing at the Marquise Aerodrome, near Calais, when leaving England. As a matter of fact, one of the most curious accidents which has ever occurred in connection with an aeroplane engine did necessitate a landing at the aerodrome in question. The induction pipe of the engine broke, necessitating a landing, which was made in the ordinary way and without any difficulty. The damage was quickly repaired, when the aeroplane continued its journey to Amsterdam, where exhibition flights are being given.

A STRIKING instance has just been afforded of the increase of speed in transport. Capt. Gathergood, winner of the Aerial Derby, carrying two passengers in an Airco 4A biplane, came through from Edinburgh to London on Tuesday week in a flying time of only  $3\frac{1}{4}$  hours, averaging a speed of 120 miles an hour.

IN connection with the direct non-stop flight from London to Madrid made by the Napier-engined Alliance "Seabird" on July 31, an interesting point has been brought out by Mr. H. T. Vane, the managing-director of Messrs. D. Napier & Son, Ltd. The flight itself was accomplished in  $7\frac{3}{4}$  hours—the cable announcing the arrival of the aeroplane at Madrid did not reach his office until  $15\frac{1}{2}$  hours after its despatch. The fact that the cable took nearly twice as long as the aeroplane to cover the distance, gives some idea of the possibilities of the aeroplane for commercial use.

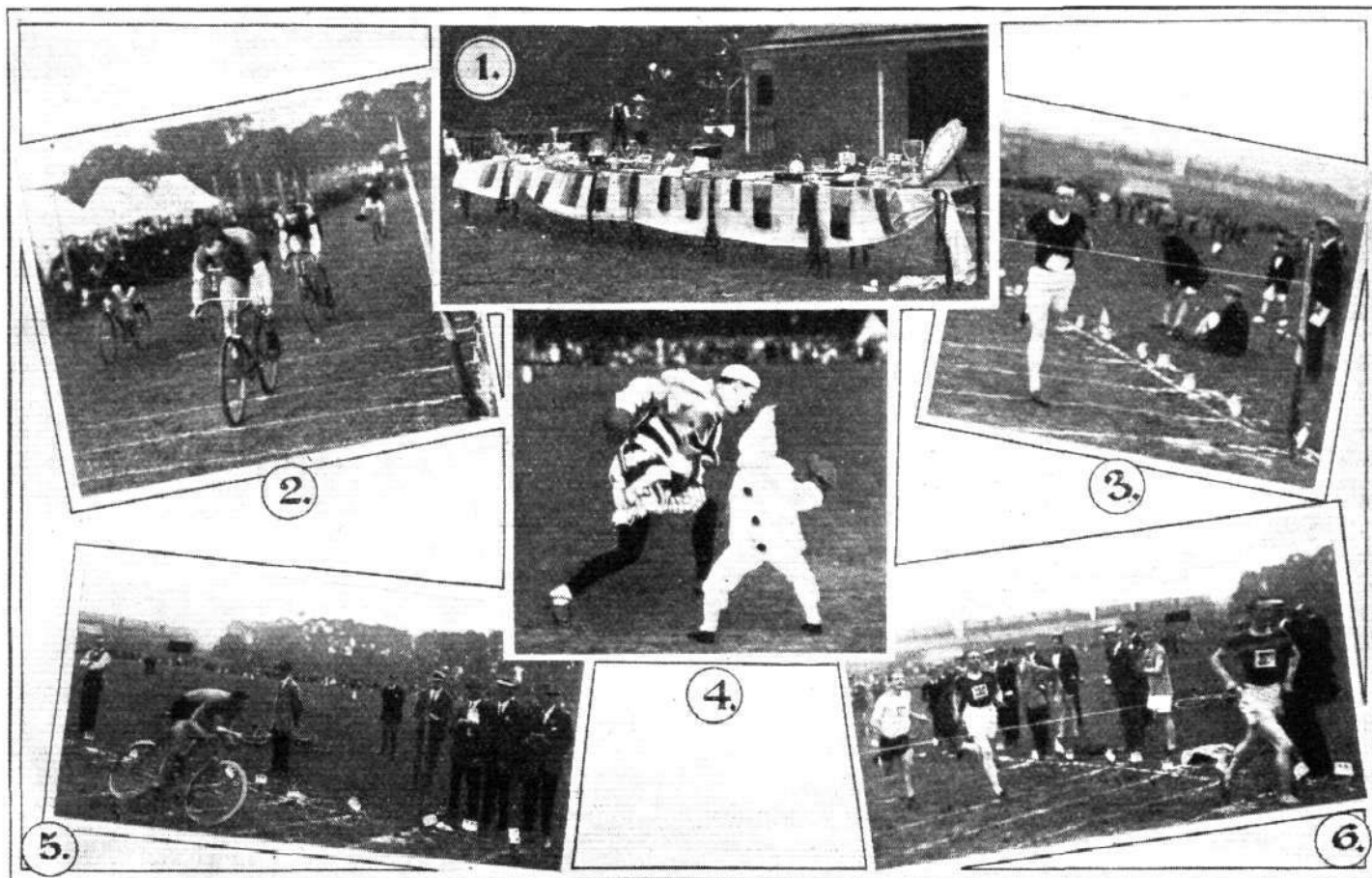
THE annual sports of the Handley Page Social and Athletic Club on the club ground in Cricklewood Lane on August 5

attracted a good "gate," and St. Dunstan's and the local hospitals should benefit considerably. A very full programme had been arranged, and there was a continuous performance until the time came for Mrs. Handley Page to distribute the fine array of prizes to the successful competitors.

FROM the Aluminium Plant and Vessel Co., Ltd., of Point Pleasant, Wandsworth, S.W.18, comes a most useful catalogue giving particulars of their productions. It is arranged on the loose-leaf principle so that it is quite simple to insert new leaves as they are issued. Apart from illustrating and describing the many varied lines which are turned out by this firm, the book contains quite a deal of valuable information regarding aluminium vessels generally. No doubt the firm will be pleased to send a copy to anyone really interested if they apply to the address given above.

MESSRS. D. NAPIER AND SON, LTD., have produced a dainty catalogue, giving a full specification and particulars of the 450 h.p. Aero engine. Although this engine is in its youth, so to speak, it has already a fine list of outstanding performances to its credit. Not the least interesting part of the book is the copy of the official certificate of the altitude record made last January when a Napier-engined D.H.9, with two up, went to 28,000 ft.

A SUPERMARINE flying boat was flying each day at the Cowes Regatta, and the facilities offered were taken advantage of by members of the R.Y.S. and other clubs in order to view and follow the yacht racing from the air. It was found that this new attraction appealed very strongly to the many yachtsmen staying at Cowes for the week. On the evening of August 7 the supermarine flying boat was chartered by Col. Wingfield to fly to Portsmouth and circle over H.M.S. *Renown* as she left the harbour. He was thus able to take part in a final farewell, in the air, to H.R.H. The Prince of Wales, on his departure for Canada.



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HANDLEY PAGE SOCIAL AND ATHLETIC CLUB SPORTS, AUGUST 5 : 1. The Prizes, which were at the finish presented by Mrs. Handley Page. 2. Finish of 880 Yards Cycle (Final)—1st, S. Hudson; 2nd, D. H. Genner; 3rd, F. G. Stevens. 3. D. C. A. Findlay winning the One-Mile Open Handicap. 4. The clown and his young companion amuse the crowd with a boxing match. 5. C. F. Davey winning the One-Mile Open Cycle Handicap. 6. Finish of 880 Yards Open Handicap—1st, H. H. Kidd; 2nd, E. P. Donovan; 3rd, J. Kilner



## CORRESPONDENCE

### HELPING TO CONSERVE THE INDUSTRY

[1978] No Department of Commerce has ever started under greater disadvantages than that seriously concerned with aeronautics. Prior to the War, a few firms, a very few, were desperately struggling to obtain and maintain a commercial foothold. These, with the experience which they had acquired by August, 1914, buoyed up and impelled by the almost unlimited purse and resources of the Government, promptly made good. Of necessity, however, there came into being, to meet the extraordinary requirements of the country, a large number of firms of mushroom growth. I do not refer in any sense to the very numerous engineering and woodworking firms who embarked upon aeronautical construction as a war measure and as a side line, many of whom are now abandoning, at all events for the time being, aeronautical construction, and reverting to their pre-War programmes, but to those firms whose sole occupation since their inception has been solely the manufacture or assembling of some aeronautical product.

It was obvious that for a very considerable period after the conclusion of Peace, many of those firms would be in perilous waters. That any considerable number of those should faint by the wayside would be a disaster to the trade at large, and to the nation, and the A.I.B. was formed with the intention of helping to steer these firms through the shoals into a safe harbour. It was felt that firms supplying raw materials to makers of component parts, and in turn that these makers of component parts who delivered their products on credit to the actual assemblers of the finished article needed a careful guidance, and the institution of a co-operative scheme which would prevent the inception of a panic.

Recollecting that the strength of a chain is the strength of its weakest link, it was hoped to prevent by foresight the collapse of any firm, or, if that could not be expected, at least to limit the mischief to a very small area.

My directors instruct me to invite through your columns the active co-operation and goodwill of all who are interested commercially in any degree in aeronautical developments.

Correspondence is invited from all such firms, and the aims and objects of the Bureau will be readily explained to all interested parties by

P. P. NICHOLL,  
Secretary, Aeronautical Intelligence Bureau, Ltd.  
20, Bedford Row, W.C. 1.

### PUBLICATIONS RECEIVED

*Pigeon Service Manual*; Royal Air Force. London: H.M. Stationery Office. Price 6d. net.  
*The Future of Aerial Transport*. Reconstruction Problems No. 34. London: H.M. Stationery Office. Price 2d.

### Catalogue

*Aluminium Tanks, Vessels, etc.* The Aluminium Plant and Vessel Co., Ltd., Point Pleasant, Wandsworth, S.W. 18.

### NEW COMPANY REGISTERED

WEST OF SCOTLAND AVIATION CO., LTD., Station Road, Eye, Suffolk.—Capital, £2,000 in £1 shares. First directors: T. H. French, F. W. French, R. W. Reeve and J. Fryer.

### IMPORTS AND EXPORTS, 1918-1919.

AEROPLANES, airships, balloons and parts thereof (not shown separately before 1910). For 1910 and 1911 figures see "FLIGHT" for January 25, 1912; for 1912 and 1913, see "FLIGHT" for January 17, 1914; for 1914, see "FLIGHT" for January 15, 1915; for 1915, see "FLIGHT" for January 13, 1916; for 1916, see "FLIGHT" for January 11, 1917; for 1917, see "FLIGHT" for January 24, 1918; and for 1918, see "FLIGHT" for January 16, 1919.

	Imports.		Exports.		Re-exportation.	
	1918.	1919.	1918.	1919.	1918.	1919.
January ...	49,402	555,989	24,765	57,571	—	—
February ...	51,941	453,822	13,545	57,972	—	—
March ...	47,930	704,424	11,451	72,716	1,000	400
April ...	33,342	97,662	10,815	25,433	—	—
May ...	942,866	136,631	67,224	38,428	—	—
June ...	864,296	1,410	35,658	41,526	—	—
July ...	1,834,293	136,463	10,800	41,290	—	—
	3,824,070	2,086,401	174,258	334,936	1,000	400

### Aeronautical Specifications Published

Abbreviations:—cyl.=cylinder; I.C.=internal combustion; m.=motors.

#### APPLIED FOR IN 1917

The numbers in brackets are those under which the Specifications will be printed and abridged, etc.

Published August 14, 1919

- 17,030. R. BOYLE and A. PAYZE. Fin surfaces of aeroplanes. (129,666.)
- 17,120. F. L. RAPSON. Means for propelling aircraft. (129,672.)
- 17,121. HIGHGATE AIRCRAFT Co. and F. HELLERS. Aircraft spars. (129,673.)
- 17,326. E. LETORD. Controlling-gear for aeroplanes. (129,681.)
- 17,327. E. LETORD. Support for radiators on aeroplanes. (129,682.)
- 17,328. E. LETORD. Connecting members for assembling and mounting aeroplane parts. (129,683.)
- 17,330. E. LETORD. Control mechanism for aero motors. (129,684.)
- 17,402. W. AND T. AVERY and H. BOLAS. Aircraft planes. (129,687.)
- 17,403. W. AND T. AVERY and H. BOLAS. Seaplanes or aeroplanes. (129,688.)
- 17,553. E. A. V. ROE, R. J. PARROTT and A. V. ROE AND Co. Hinged stabilising planes. (129,696.)
- 17,631. CELLON, LTD., and A. J. A. W. BARR. Doping aeroplane fabrics. (129,698.)
- 17,755. S. E. SAUNDERS. Alighting gear for aircraft. (129,705.)
- 17,940. SOC. ANON. DES ATELIERS D'AVIATION BREGUET. Ropes, wires or shrouds or aircraft. (129,711.)
- 17,975. AIRCRAFT MANUFACTURING Co., G. DE HAVILLAND and J. S. CHAPMAN. Fuel supply pumps for aero engines, etc. (129,713.)
- 17,994. E. MCGRUBER. Aerial propellers. (129,714.)
- 18,166. BLACKBURN AEROPLANE AND MOTOR Co. and H. BOOTH. Indicator of variations in direction of travel of aircraft. (129,719.)
- 18,232. J. J. MAYROW. Frame members of aircraft. (129,723.)
- 18,246. A. E. BREWERTON. Gyroscopical direction-indicators. (129,724.)
- 18,292. F. W. LANCHESTER. Lateral plumb indicator for aircraft. (129,727.)
- 18,506. H. E. F. GOOLD-ADAMS and S. L. COLLINS. Balloons, etc. (129,732.)

#### APPLIED FOR IN 1918

The numbers in brackets are those under which the Specifications will be printed and abridged, etc.

Published August 14, 1919

- 8,270. W. S. COOKE and F. SALE. Inclonometer or inclinometer for aircraft, etc. (129,753.)
- 11,436. BOULTON and PAUL, LTD., and J. D. NORTH. Control devices for aircraft. (129,781.)
- 11,489. C. A. CLEGHORN. Self-sealing petrol tanks. (129,783.)
- 12,636. A. A. HOLLE. Aerofoils. (129,834.)
- 13,191 and 13,192. BLACKBURN AEROPLANE AND MOTOR Co., H. BOOTH and G. BEAUMONT. Spars, struts and other structural members for aircraft. (129,845 and 129,846.)
- 14,638. R. MARSHALL. Control of aircraft. (129,861.)
- 17,252. J. BASSETT, G. E. D. SEALE and G. DAVIDSON. Heating appliances for aeroplanes, etc. (129,888.)
- 18,121. G. FERGUSON. Lateral inclinometer for aircraft. (129,895.)

If you require anything pertaining to aviation, study "FLIGHT'S" Buyers' Guide and Trade Directory, which appears in our advertisement pages each week (see pages xlix, 1, li and lii)

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